Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

http://www.archive.org/details/dictionaryofscie00hoblrich

George Davison

A

DICTIONARY

OF

SCIENTIFIC TERMS.

BY

ennis 1803-1886

RICHARD D. HOBLYN, A.M. Oxon.

AUTHOR OF

"A DICTIONARY OF MEDICAL TERMS,"

OF "MANUALS OF NATURAL PHILOSOPHY, OF CHEMISTRY, AND

OF THE STEAM ENGINE;"

OF "FIRST BOOKS IN SCIENCE," &c. &c.

NEW YORK: D. APPLETON AND CO.
PHILADELPHIA: G. S. APPLETON.
1850.

Q123
.H68

54723
Bancroft Library

ELLINOR C. DAVIDSON ESTATE
DECEMBER 1945

DICTIONARY
OF
SCIENTIFIC TERMS.

A'BACUS (ἄβαξ, a counter, a chess-board). An ancient instrument for aiding numerical calculations. The Greek abacus consisted of an oblong frame, having wires stretched across it, carrying perforated ivory balls. In the Roman abacus, the counters were slid along grooves.

ABBREVIATION (*abbrevio*, to shorten). An arithmetical term, denoting the reduction of a fraction to lower terms, by dividing the numerator and the denominator by any common factors which they contain. Thus $\frac{270}{375}$ divided by 5 gives $\frac{54}{75}$; and this, again divided by 3, gives $\frac{18}{25}$. The fraction is thus reduced or *abbreviated*, and, when it can no more be reduced, it is said to be in its *lowest terms*.

ABDO'MEN (*abdo*, to conceal). The posterior and principal cavity containing the bowels and many other viscera of the animal. The abdomen is distinct from the thorax in the crustaceans, the spiders, and the insects.

ABDOMINA'LES (*abdomen*, the belly). An order of *malacopterygious* or soft-finned fishes, which have their ventral fins placed on the abdomen, behind the pectorals. The sub-families of the order are termed by Cuvier, cyprinoïdes, siluroïdes, salmonoïdes, clupeoïdes, and lucioïdes, from the respective typical genera of the carps, the silures, the salmons, the herrings, and the pikes.

ABDU'CTOR MUSCLE (*abduco*, to draw from). A muscle whose office is to draw one part of the body from another. Thus the rectus externus is called *abductor oculi*, from the action of this muscle in drawing the eye away from the nose. See *Adductor*.

ABE'RRANT (*aberro*, to wander from). A term applied in classification to those species which deviate most from the type of their natural group.

ABERRA'TION OF LIGHT (*aberro*, to wander from). An astronomical phenomenon consisting in an alteration in the *apparent* position of all the stars, owing to the velocity with which light moves, and to the motion of the earth in her orbit, in a direction which forms a tangent to the light from the heavenly bodies. In consequence of the aberration resulting from the combined operation of these two velocities, all the fixed stars appear to us to be rather more backward than they really are in the direction of the earth's annual motion. Aberration is never so much as 21″; in other words, the apparent place of the star differs from its real place less than the *ninetieth* part of the apparent diameter of the sun.

1. *Aberration, Spherical.* A term employed in Optics to denote the deviation of the rays of light from the true focus of a curved lens or mirror; in consequence of which, instead of concentering in a single point, they are spread over a certain surface, forming a confused image of the object. These aberrations proceed, 1, from the form of curvature of the lens or mirror, and 2, from the different refrangibility of the rays of light. See *Refrangibility*.

2. *Aberration, Chromatic.* A term employed in Optics to denote the imperfection arising from the unequal refrangibility of the rays composing white light,

in consequence of which the image of the object, viewed through a lens, will be surrounded by prismatic colours. Spherical aberration produces distortion, chromatic aberration produces false colour, of the object.

3. *Aberration, circle of.* The *circle* of coloured light observed, in experiments with convex lenses, between the *point* where the violet or most refrangible, and the *point* where the red or least refrangible rays meet.

ABIETI'NÆ (*abies*, a fir-tree). A section of the Coniferæ, or Fir-tree tribe of plants, comprising the Fir, the Pine, the Araucaria, the Dammara, and the Cunninghamia.

A'BLATIVE CASE (*ab*, from, *fero*, *latus*, to take). Literally, the *taking away* case; a case belonging to the Latin language, and known by prepositions, expressed or understood. It is represented in the English language by the preposition *from*. See *Case.*

ABNO'RMAL (*ab*, from, *norma*, a rule). Irregular; that which deviates from the usual order. The term *anormal* is also employed to denote any thing that is *without rule* or order. The terms are nearly synonymous.

ABO'RTIVE (*aborior*, to be born before the time). A term applied in botany to any part of a plant which does not acquire its normal development: stamens which have no anthers, and seeds which have no embryos, are said to be abortive. But abortion may be constant: the ovarium of the Cocoa palm is three-celled; the fruit has only one cell, the other two becoming constantly abortive.

ABRA'NCHIA (α priv., βράγχια, gills). The third order of the *Anellida* of Cuvier, comprising animals which have no gills, or apparent external organs of respiration, but respire by the entire surface of the skin, or by internal cavities. They are distinguished into the setigerous, or worms, and the non-setigerous, or leeches. The term *Abranchia* has been also applied to an order of amphibious animals, which are not known to undergo metamorphosis, but breathe by lungs during the whole period of life. The order comprises only two genera, viz. the *menopoma* and the *amphiuma* of North America.

A'BRAZITE. A mineral found in the cavities of volcanic rocks, with calcareous spar, at Capo di Bove, near Rome. It occurs in semi-globular masses, and in octohedral crystals with a square base. It is also termed *zeagonite* and *gismondine.*

ABRU'PTLY PINNATE. A pinnate leaf is thus named in botany, when its petiole has no terminal leaflet or tendril, as in Orobus tuberosus.

ABSCI'SSA (*abscindo*, to cut off). *Linea abscissa.* A term employed in Conic Sections, to denote that portion of the major axis of an ellipse which is *cut off* by an ordinate. The term is equally applicable to the parabola and to the hyperbola. See *Ordinate* and *Co-ordinate.*

A'BSOLUTE and RE'LATIVE. In logic, a noun which denotes an object considered as a whole, and without reference to any thing of which it is a part, or to any other part distinguished from it, is called *absolute.* When, on the other hand, an object is considered as a part of a whole, viewed in reference to the whole, or to another part of a more complex object of thought, the noun expressing this view is called *relative.* Thus, "father" and "son" are relatives, being regarded, each as a part of the complex object, father-and son; whereas the same object designated absolutely would be termed a man, living being, &c.

ABSORPTION (*absorbeo*, to suck up). A function in physiology, by which the materials of growth are *absorbed* and conveyed to the organs of the body, and by which the decayed and useless parts are *absorbed* and removed from the system.

1. *Interstitial Absorption.* The function by which the particles of the tissue which fill the meshes of the capillary network are removed, as in the atrophy of the tail of the tadpole, and of the pupillary membrane in the fœtus, and in the development of cells in bones.

2. *Absorption, in Chemistry.* This term denotes the passage of a gas or vapour into a liquid or solid substance; or that of a liquid into the pores of a solid. Thus, water absorbs carbonic acid gas, lime absorbs water, &c.

ABSTRACT and CONCRETE. 1. In logic, when a notion derived from the view taken of any object, is expressed with a reference to, or as taken in conjunction with, the object which furnished the notion, it is expressed by a *concrete* term, as "foolish" or "fool;" when without any such reference, by an *abstract* term, as "folly." 2. In arithmetic, when numbers are used with reference to the things numbered, as 3 shillings, 4 acres, 5 kingdoms, they are said to be *concrete* numbers; when used without such

Acanthus

reference, merely to indicate a certain number of units of the same kind, as when we simply say 3, 4, 5, they are called *abstract* numbers. The multiplication table is a series of abstract numbers. See *Abstraction.*

ABSTRA'CTION (*abstraho*, to draw off). The operation of the mind by which we *draw off*, and contemplate separately, some portion or property of an object, as the scent of a rose, disregarding all else that belongs to it. The operation, therefore, strictly speaking, may be limited to the contemplation of a *single* object. But the term is usually employed in a wider sense: in contemplating *several* objects which agree in certain points, we abstract the circumstances of agreement, disregarding the differences, and give to all and each of these circumstances a common name, expressive of this agreement; we are then, properly, said to *generalize.* Abstraction, therefore, does not necessarily imply generalization, though generalization implies abstraction.

ABSU'RDUM, REDUCTIO AD. A form of argument, frequently employed in geometrical reasoning, by which, instead of proving the thing asserted, the absurdity is shown of every thing which contradicts that assertion. For it follows that, if every thing which contradicts a proposition be false, the proposition itself must be true.

ABU'NDANT NUMBER. Any number which is less than the sum of its divisors, as 12, which is less than the sum of ~~1~~, 2, 3, 4, and 6, all of which are its divisors, and their sum is 16. A *deficient* number is that which is greater than the sum of its divisors; a *perfect* number, that which is equal to the sum of its divisors. 123

ACALE'PHÆ (ἀκαλήφη, a nettle). Sea-nettles; a class of gelatinous zoophytes, found in the water of the ocean, and so named from the stinging sensation which many of them produce when touched. To this class belong the sea-jelly, sea-nettle, Portuguese man-of-war, &c. By the old naturalists they were known by the title of *urticæ marinæ.* See *Malactinia.*

ACA'NTHA (ἄκανθα, a thorn). A spine, or prickle of a plant. A prickly fin of a fish. A spinous process of a vertebra.

ACANTHA'CEÆ. The Justicia tribe of Dicotyledonous plants, named from the genus *Acanthus.* Herbaceous plants or shrubs, with *leaves* opposite; *corolla* gamopetalous; *stamens* mostly 2; *capsule* 2-celled, bursting elastically with 2 valves; *seeds* usually hooked, exalbuminous.

ACANTHA'LES. An alliance of Dicotyledonous plants. *Flowers* unsymmetrical, usually didynamous. *Seeds* adhering to hard hook like processes of the placenta. *Albumen* 0. *Calyx* 4-5-leaved, remarkably imbricated, as if in more whorls than one; often enveloped in large bracts.

ACA'NTHOCE'PHALA (ἄκανθα, a spine, κεφαλὴ, the head). Hooked worms; an order of the *Entozoa*, which have an elongated cylindrical body, with the anterior part closely covered with small sharp spines, and the oral aperture leading to a ramified alimentary canal.

ACA'NTHOPTERY'GII (ἄκανθα, a thorn, πτερύγιον, a fin). Spinous-finned fishes, or fishes whose dorsal fins are bony and prickly; one of the three primary grand divisions, or natural orders of fishes, established by Cuvier. The order comprises fifteen families.

ACA'NTICONE. A sub-species of prismatoïdal augite, occurring in primitive beds and veins, in Norway and other parts. It is of a pistachio-green colour, and is known by the names *pistacile* and *epidote.*

A'CARIDÆ. A family of the Arachnida, belonging to the order Tracheata, and named from the typical genus *acarus*, to which the mite, the tick, the water-mite, and the flesh-worm belong. The last of these is distinguished from the rest by the presence of only six feet.

ACAULE'SCENT (α, priv., καυλὸς, a stalk). Stemless; a term applied to a plant in which the stem is apparently absent, and the leaves seem to rise from the root, as in Cnicus acaulis. As, however, according to the theory of vegetable development, a stem is assumed to exist, the term *subcaulescent* would be preferable.

ACCELERA'TION (*accelero*, to hasten). The increase of the motion of moving bodies. Thus, a stone, falling to the earth, moves faster and faster as it descends; its motion is therefore said to be *continually accelerated;* in other words, its velocity continually increases.

1. *Acceleration of the fixed stars.* The time by which the stars, in their diurnal revolution, anticipate the mean diurnal revolution of the sun; which is three minutes and fifty-six seconds. Thus, a star, which to-day passes the meridian at twelve o'clock, mean time, will pass the

meridian to-morrow three minutes and fifty-six seconds before twelve o'clock.

2. *Acceleration of the planets.* The motion of the planets varies in different parts of their orbits, according as they are at a greater or less distance from the sun. From their aphelion to their perihelion their motion is *accelerated;* from their perihelion to their aphelion it is retarded. The average of these motions through the whole orbit (the space divided by the time) is called the *mean motion.* Hence, the acceleration of a planet is the excess of its real diurnal motion over its mean diurnal motion.

3. *Secular acceleration of the moon's mean motion.* An increase in the velocity of the moon's mean motion around the earth. It amounts to about 11 seconds per century—a quantity small in itself, but becoming considerable by its accumulation during a succession of ages.

A'CCENT (*accentus*, from *accino*, to sing in concert). A peculiar stress or elevation of the voice, which distinguishes one syllable in every word which consists of more than one syllable. The syllable so distinguished is said to have the *acute* accent, which is marked thus (′); the *grave* (`), which is seldom marked, is *supposed* to be placed over those syllables which are pronounced without the elevation of the voice; the *circumflex* (ˆ or ˜) is supposed to be formed by a combination of the acute and the grave, and hence is usually placed over contracted syllables. In modern languages the accent, when it falls upon a short syllable, has, in most cases, the same effect as if it were long; but in the ancient languages, accent and quantity were distinguished from each other.

ACCENTS, MATHEMATICAL. Different magnitudes of the same kind, or magnitudes placed in similar positions, are denoted, in algebraical calculations, by the use of the same letter distinguished by accents. The accented letter a' is read *a accented* or *a dashed;* a'' is read *a twice accented*, or *a twice dashed*, or, more commonly, *a two dash.* When accents are inconveniently numerous, Roman figures are employed: thus a^{iv} is used instead of a''''. The accented letter is the *metaphor* of algebra.

A'CCESSORY VALVES (*accedo*, to be added). Small *additional* valves placed near the umbones or bosses of the genus *pholas* among shells, and on the edges of the pedunculated barnacles, among annulose animals.

A'CCIDENT (*accido*, to happen to). This term, in its widest technical sense, denotes any thing which can be attributed to an object, and can only be conceived as belonging to some substance, in which sense it is opposed to "substance." In its more restricted and logical sense, it is a predicable, which may be absent or present, the essence of the species remaining the same. An accident is called *separable*, when it may be separated from the individual; *inseparable*, when it cannot be separated from the individual: the word "individual" is here emphatic, because *every accident* must be separable from the *species*, else it would be a *property.*

ACCI'PITRES (*accipiter*, a hawk). *Raptores.* Rapacious birds; birds of prey; known by their hooked beak and talons. They are distinguished into the *diurnal* and the *nocturnal;* the former comprising the falcons, eagles, vultures, &c.; the latter the owls.

A'CCLIMA'TION. Naturalization to a foreign or unusual climate; a term applied to plants and animals.

ACCRE'TION (*accresco*, to grow to). The addition of new parts, as in the formation of a crystal by the position of new parts around a central nucleus. The organic and inorganic kingdoms are distinguished by their mode of increase; the former increasing by *intus-susception* and alimentation, the latter by *accretion* without alimentation.

ACCU'MBENT (*accumbo*, to lie down). Lying against any thing, as the *edges* of the cotyledons against the radicle in some cruciferous plants. See *Incumbent.*

ACCU'SATIVE CASE (*accuso*, to accuse). Literally, the *aiming at* case; a case belonging to the Latin language, and denoting, originally, the object to which any motion or action is directed; it was, afterwards, employed to distinguish the object of any action or feeling. It corresponds with the *objective case*, or the *object*, of the English Grammar. See *Case.*

-ACEOUS. Terminations in *-aceous* denote a resemblance to a substance, as membranaceous, resembling membrane; whereas terminations in *-ous* denote the substance itself, as membranous, belonging to membrane.

ACE'PHALA (α, priv., κεφαλὴ, the head). Headless animals; a class of the *Mollusca*, which have no head, but simply a pharynx, or beginning of the œsophagus without jaws, tongue, or mouth properly so called, as in the oyster. According to Cuvier, this class of molluscous animals comprehends many genera with bivalve shells, or *acephala testacea;* and a few which are devoid of shells, or *acephala nuda.*

ACEPHALO'PHORA (*α*, priv., *κεφαλὴ*, the head, *φέρω*, to bear). A term applied by Blainville to a class of molluscous animals corresponding with the acephala and the brachiopoda of Cuvier.

ACERA'CEÆ. The Sycamore tribe of Dicotyledonous plants, named from the genus Acer. Trees, with *leaves* opposite; *petals* generally 5; *stamens* usually 8, inserted with the petals on a hypogynous disk; *fruit* dicarpellary, samaroid; *seeds* exalbuminous.

ACERA'LES. An alliance of Dicotyledonous plants. *Stamens* definite in number. *Flowers* usually unsymmetrical in their parts, or, if symmetrical, more or less irregular; in the majority, small, and disposed in a compound inflorescence.

A'CERIC ACID. A peculiar acid said to exist in the sap of the *acer*, or maple tree.

A'CEROSE (*acerosus*, chaffy). Sharp-pointed; tapering to a fine point, as the leaves of juniper.

ACE'SCENT (*acesco*, to become sour). A term applied to substances which become sour spontaneously, as vegetable and animal juices, or infusions.

ACETA'BULUM (*acetum*, vinegar). A vinegar-cruet; and hence a cup-like cavity, as the suckers on the arms of the cuttle-fish, the cavity of the hip-joint, the socket on the trunk of insects which receives the leg. Also, a Roman measure containing two ounces and a half.

ACE'TAL. A compound of aldehyde with ether, formed by the action of platinum black on the vapour of alcohol with the presence of oxygen. The term is derived from *acetum*, vinegar, and the first syllable of *alcohol*.

A'CETATE (*acetum*, vinegar). A salt formed by the union of acetic acid with an alkaline, an earthy or a metallic base.

ACE'TIC ACID (*acetum*, vinegar). The pure acid of vinegar. It occurs, ready formed, in several products of the vegetable kingdom, and is generated during the spontaneous fermentation of many vegetable and animal juices. By *real* acetic acid is meant such an acid as occurs in a dry acetate: it cannot exist in an uncombined state.

ACETO'METER (*acetum*, vinegar, *μέτρον*, a measure). An instrument for ascertaining the strength of vinegars. It consists of a globe of glass about three inches in diameter, having a little ballast ball drawn out beneath, and a stem above of about three inches long, containing a slip of paper, with a transverse line in the middle, and surmounted with a little cup for receiving weights or poises.

ACE'TONE. The new chemical name for *pyro-acetic spirit;* a limpid colourless liquid, prepared by distilling a mixture of two parts of crystallized acetate of lead and one part of quicklime in a salt-glaze jar. The names of such pyrogen bodies terminate in *one*, as contain one atom of oxygen and are neutral.

ACE'TYL. A hypothetical radical, pervading a series of compounds, including acetic acid, and prepared by abstracting two atoms of oxygen from ethyl. The term is derived from *acetum*, vinegar, and *ὕλη*, matter.

ACHÆ'NIUM (*α*, priv., *χαίνω*, to open). An *indehiscent* fruit; one-celled, one-seeded, superior, hard, and dry, with the integuments of the seed distinct from it. It occurs in the Labiatæ and the Boragineæ.

ACHA'TINÆ. Spiral snails; a subfamily of the *Helicidæ*, named from the genus Achatina: the spire of their shells is elongated and conical.

ACHE'RNAR. A star of the first magnitude in the southern constellation Eridanus.

ACHE'TIDÆ. A group of Orthopterous insects, belonging to the family *Saltatoria*, and including the species known as *crickets*. Many of them burrow in the ground, and most of them, like the house-cricket, are nocturnal. Few have any power of active flight.

A'CHIRITE. Emerald malachite; a mineral consisting of oxide of copper, carbonate of lime, silica, and water.

ACHLAMY'DEOUS (*α*, priv., *χλαμὺς*, a cloak). The general name of all those plants from which the floral *envelopes*—the calyx and the corolla—are both absent.

A'CHMIT. A mineral, supposed to be a bisilicate of soda, combined with a bisilicate of iron.

ACHROMA'TIC (*α*, priv., *χρῶμα*, colour). An optical term signifying *colourless* as applied to a lens, in which the primary colours which usually accompany the transmission of the image of any object through such a medium, are destroyed. The colours which appear round the edges of an object, when viewed through an ordinary telescope, are produced by the different refrangibility of the rays of light; and telescopes which are constructed so as to counteract or prevent this aberration, are termed *achromatic*.

ACI′CULAR (*acicula*, a little needle). A term applied, in crystallography, to *needle shaped* crystals; and, in botany, to the leaves of plants which are long, stiff, and pointed, like a needle; or to surfaces which are marked with fine needle-like streaks.

A′CIDS. A class of compounds which generally possess a sharp and sour taste, and are often highly corrosive; they redden the infusions of blue vegetable colours, and combine with the alkalies, earths, and metallic oxides, forming compounds in which the characters of the constituents are entirely destroyed, and new characters produced differing in every respect from those previously existing. See *Alkalies.*

1. *Oxygen Acids.* When the same element forms two acid compounds with oxygen, the name of that which contains the greater proportion of oxygen is made to terminate in *ic*, the other in *ous*, as in sulphuric and sulphurous acids. A lower degree of oxidation is expressed by prefixing the Greek preposition *hypo* (ὑπὸ, under), as in hypo-sulphurous acid; while another new compound, intermediate between the sulphurous and sulphuric acids, was named hypo-sulphuric acid. On the same principle, the highest degree of oxidation is expressed by prefixing the Greek preposition *hyper* (ὑπὲρ, over), as in hyper-chloric acid. This nomenclature has been adopted for all analogous acids.

2. *Hydrogen Acids.* These are acid compounds of certain substances, as chlorine, sulphur, and cyanogen, with hydrogen, and they are hence called *hydracids.* In these compounds the names of both constituents appear, as in the terms *hydrochloric, hydrosulphuric*, and *hydrocyanic acid.* Thénard has lately altered these names to *chlorhydric, sulphohydric*, and *cyanhydric* acid, which are better terms.

3. *Sulphur acids.* In this class of acids sulphur is united with the other element in the place of oxygen. The names of the corresponding oxygen acids are sometimes applied to these with the prefix *sulpho*, as *sulpho-arsenious* and *sulpho-arsenic* acids, which resemble arsenious and arsenic acids respectively in composition, but contain sulphur instead of oxygen.

ACIDIFI′ABLE. Capable of being converted into an acid by an acidifying principle. Substances possessing this property are called *radicals*, or acidifiable bases.

A′CIDIFYING PRINCIPLE. That principle which is capable of converting a substance into an acid.

ACIDI′METRY (*acidum*, an acid, μέτρον, a measure). The process of measuring the strength of an acid, by saturating a given weight of it with an alkaline base: the quantity of the base required for saturation is a *measure* of the strength of the acid.

ACIDULOUS. Slightly acid; a term frequently applied to mineral waters which contain carbonic acid; and, in chemical language, to those salts in which the base is combined with such an excess of acid, that they distinctly exhibit acid properties, as the super-tartrate of potassa.

ACINA′CIFORM (*acinaces*, a scimitar, *forma*, likeness). Scimitar-shaped; plane on the sides, with one border thick, the other thin, as the succulent leaves of the Mesembryanthemum acinaciforme.

A′CINI (plural of *acinus*, a grape-stone). A term applied by some carpologists to the minute component parts of the raspberry: incorrectly, however; for these are drupes. The term is also applied to the secerning parts of glands, when they are suspended like grains or small berries from a slender stem.

ACLI′NIC LINE (α, priv., κλίνω, to incline). The name given by Professor August to an irregular curve in the neighbourhood of the terrestrial equator, where a needle balances itself perfectly horizontally. It is sometimes called the *magnetic equator.*

ACORA′CEÆ. An order of Monocotyledonous plants, named from the genus Acorus. Rhizoma jointed; *leaves* ensiform; *flowers* hermaphrodite, surrounded with scales; *spathe* leaf-like; *stamens* with 2-celled anthers, turned inwards; *ovaries* distinct; *fruit* finally juiceless; *seeds* albuminous.

A′COTYLE′DON (α, priv., κοτυληδὼν, a seed-lobe). A plant whose embryo has no cotyledons, or seed-lobes. But the *acotyledonous embryo* is not exactly, as its name seems to indicate, an embryo without cotyledons; for, in that case, cuscuta would be acotyledonous. On the contrary, it is an embryo which does not germinate from two fixed invariable points, namely, the plumule and the radicle, but indifferently from any point of the surface, as in some Araceæ, and in all flowerless plants.

ACOU'STICS (ἀκούω, to hear). The science of sound; the laws which regulate the vibrations of air, or of other media, in their relation to the organ of hearing.

A'CRITA (ἄκριτος, indistinct). A primary division of the Animal Kingdom, composed of the lowest classes of the radiate animals, and characterized by an *indistinct*, diffused, or molecular condition of the nervous system, and by the absence of distinct parietes to the alimentary canal. To this division belong the medusa, the polype, &c. These are the *cryptoneura* of Rudolphi, the *protozoa* and *oozoa* of others. See *Nematoneura.*

A'CROGEN (ἄκρος, extreme, γείνομαι, to grow). Point-grower; the classical name of a plant which grows only at its *point*, or upper extremity, as a fern tree, and is thus distinguished from an *endogen* on the one hand, and an *exogen* on the other.

ACRO'LEINE (ἄκρος, extreme, ἔλαιον, oil). A substance of a very pungent odour given off by oils and fats when boiling at a high temperature, and produced in large quantity by the distillation of pure glycerin.

ACRO'NYCHAL (ἄκρος, extreme, νὺξ, night). A Greek term denoting the *extremities*, or the beginning and the end, *of the night.* Hence, a star is said to be acronychal, or to rise acronychally, when it rises at sunset, and consequently sets at sunrise.

A'CROSPIRE (ἄκρος, extreme, σπεῖρα, a spire). That part of a germinating embryo which botanists call the *plumula*, and which bears the cotyledons. It has a curved form, and makes its appearance at the extremity of the seed.

ACTERAI'MIN. A star of the third magnitude, in the left shoulder of Cepheus, marked α.

ACTINE'NCHYMA (ἀκτὶν, a ray of light, ἔγχυμα, an infusion). A term applied by some botanical writers to the *stellate*, or star-shaped variety of spheroïdal cellular tissue.

ACTI'NIA (ἀκτὶν, a ray of light). A form of polype, in which the mouth occupies the centre of the upper surface, and is surrounded by tentacula, which radiate from the centre, like the petals of a flower. Hence, the genus has acquired the names of *animal flowers, sea anemones*, &c. From the fibrous character which the substance of their bodies assumes, they have been named by zoologists *fleshy polyps.*

ACTINO'CEROS (ἀκτὶν, a ray, κέρας, a horn). A generic term, signifying the radiated disposition of the horns or feelers of animals.

ACTI'NOLITE (ἀκτὶν, a ray of light, λίθος, a stone). A green-coloured mineral, forming a variety of hornblende, and usually occurring in fascicular crystals, which are arranged in the form of *rays.* It is found chiefly in primitive districts with a magnesian basis. There are three varieties,—the crystallized, the asbestous, and the glassy.

Actinolite slate. A hornblendic rock, composed of actinolite and felspar, and easily recognized by its light-green colour, and the elongated form or fibrous appearance of its principal constituent mineral.

ACTINO'METER (ἀκτὶν, a ray of light, μέτρον, a measure). An instrument for measuring the intensity of light. This instrument indicates the force of sunshine at the Cape of Good Hope as 48° 75', while ordinary sunshine in England is only from 25° to 30°.

ACTION. The motion which one body produces, or endeavours to produce, in another. *Mechanical action* is exerted by percussion or by pressure; and, in either case, the force exerted by the acting body is repelled in an equal degree by the body on which it acts: the stroke of the hammer on a nail, acts upon the former equally as on the latter. In all such cases, the counteracting force is termed *re-action;* and it is a law in Physics that "action and re-action are equal."

ACTIVITY, SPHERE OF. The space within which the action of a body produces a sensible effect.

A'CUBENE. A star of the fourth magnitude, in the southern claw of Cancer, marked α.

ACULEA'TA (*aculeus*, a sting). A group of *Hymenopterous* insects, in which the abdomen of the females and neuters is armed with a sting connected with a poison reservoir. The antennæ are twelve in number in the female, and thirteen in the male.

ACU'LEATE (*aculeus*, a prickle). Prickly; a term applied, in botany, to a surface covered with prickles, as the stem of the rose.

ACU'LEUS (dim. of *acus*, a needle). A prickle; a hard conical expansion of the bark of certain plants, as of the rose. It is distinguished from the thorn or spine by the nature of its tissue: the prickle consists of cellular, the spine of woody tissue.

ACU'MINATE (*acumen*, a sharp point). Pointed; ending in a tapering, acute point, as the leaf of Salix alba.

ACU'TE (*acutus*, sharp). This term, in Geometry, is opposed to *obtuse:* an acute angle is that which is less than a right angle, or does not subtend an angle of 90 degrees; an acute-angled triangle is that which has three acute angles; an acute-angled cone is that whose opposite sides form an acute angle at the vertex. In Acoustics, the term acute is opposed to *grave*, and denotes that the sound of the voice or of a musical instrument is *raised* with respect to some other sound.

ADA'GIO. An Italian term signifying *slowly*, and employed to indicate the slowest movement in music. The degrees of movement are as follows: *adagio*, very slow; *largo*, slow; *andante*, moderate; *allegro*, quick; *presto*, very quick.

A'DAMANT (α, priv., δαμάω, to subdue). This term, which simply means *unconquerable*, is usually applied to the hardest metal, probably steel. By Plato it was applied to a compound of gold and steel. By others it has been referred to the diamond.

ADAMA'NTINE SPAR. The crystals of *Corundum*, so named from their approaching to adamant in hardness. It is a variety of crystallized alumina, nearly resembling the sapphire in composition, and is usually found in granite, and sometimes in primary limestone.

ADDI'TION (*addo*, to give to). The operation of *adding*, or taking together, any numbers or magnitudes, with the view of finding the resulting number or magnitude, which is called their *sum*. The sign of this operation is +, which is read *plus*, or *more:* thus, $a + b$ signifies that the number indicated by b is to be added to that indicated by a, and represents the sum of a and b.

A'DDITIVE and SUBTRACTIVE. Terms sometimes applied to algebraical quantities, in the same sense, respectively, as *positive* and *negative*, and with the advantage of greater precision of meaning.

ADDU'CTOR MUSCLE (*adduco*, to draw to). A muscle whose office is to draw one part of the body to another, as that which closes the two parts of a bivalve shell; in this case, its base or insertion is indicated by an irregular depression in each valve, termed the *muscular impression*. See *Abductor*.

ADE'LPHIA (ἀδελφὸς, a brother). Literally, a *brotherhood;* a term applied in botany to a combination of the filaments of the stamens into a single mass. Thus, if there is only one combination, as in Mallow, the filaments are said to be *mon-adelphous;* if there are two, as in Pea, they are *di-adelphous;* if three, as in some species of St. John's Wort, they are *tri-adelphous;* if many, as in Melaleuca, they are called *poly-adelphous*. The tube formed by the union of monadelphous filaments is termed, by Mirbel, *androphorum*.

A'DEPT (*adipiscor*, to obtain). A characteristic denomination of those alchemists, who were supposed to have obtained the grand objects of their inquiry, viz. the philosopher's stone and the universal remedy.

ADFE'CTED or AFFE'CTED. A term applied in Algebra to those *equations* into which the first or *simple power* enters as well as the *square* of the unknown quantity; thus $x^2 + 4x = 45$. When applied to a *quantity*, it denotes that the quantity has a co-efficient, or proper sign; thus, in the quantity $+ 5x$, the quantity x is said to be *affected* with the co-efficient 5, and with the positive sign +. See *Quadratics*.

ADHE'SION (*adhæreo*, to stick to). A term denoting, in physics, the force by which bodies, whether similar or dissimilar, adhere together, when their surfaces are brought in contact. It differs from *cohesion*, which denotes the force by which the particles of a body are held together. Adhesion relates to *masses*, cohesion to *molecules:* a drop of water maintains its globular form by cohesion; it moistens other bodies, as lime and sand, by adhesion; and, on its solidification in the form of mortar, the adhesion becomes cohesion.

ADHE'SION, VEGETABLE (*adhæreo*, to stick to). A property of vegetable tissue, by which contiguous parts grow together. Opposite leaves may adhere, and become *connate*; sepals may adhere entirely, forming a *gamosepalous* calyx, or partially, and constitute a *labiate* calyx; petals may adhere, forming a *gamopetalous* corolla; stamens may adhere, and form an *adelphia;* carpels may adhere, and form a *syncarpous* or compound fruit.

ADHIL. A star of the sixth magnitude, on the garment of Andromeda.

A'DIPOCERE (*adeps*, fat, *cera*, wax). The fatty and spermaceti-like substance into which muscle is converted by long immersion in water or spirit, or by burial in moist earth.

ADIPOCERE MINERAL. A fatty matter, resembling adipocere, found in the argillaceous iron ore of Merthyr.

A'DIT (*aditus*, an approach). A subterraneous passage, in mining operations, beginning at the bottom of a valley, and continued up to the vein, for the purpose of carrying out the minerals and of drawing off the water.

A'DJACENT ANGLES. The two angles formed at the point where one straight line falls upon another, the former line constituting one of the sides of each angle, and the latter line constituting the other side of each. See *Angle*.

A'DJECTIVE (*adjicio*, to add to). In grammar, a word which, being *added to* a noun, qualifies or limits its application. Adjectives are termed *attributive*, when they denote a quality; *numeral*, when they refer to number. The possessive pronouns might be termed pronominal adjectives; the demonstrative and distributive pronouns may also be referred to the adjective, as they both precede and designate nouns, but never supply their place.

A'DJECTIVE COLOURS. Colours which require the intervention of some base or mordaunt, in order to enable them to adhere to the cloth, in the manufacture of dye-stuffs.

ADNA'TE (*adnatus*, grown to) Grown to any thing, as the anther to the face of the filament in polygonum. See *Innate*.

ADOLE'SCENCE (*adolesco*, to grow). The period of life in which the body has acquired its utmost development; commencing at puberty, and terminating, in the male, about the twenty-fifth, and in the female, in the twenty-first year.

ADO'PTER, or ADAPTER. A vessel with two necks placed between a retort and a receiver, and serving to measure the length of the neck of the former.

ADULA'RIA. A sub-species of prismatic felspar, the finest specimens of which are procured at Adula, on the summit of St. Gothard. By lapidaries it is termed *moonstone*, from the play of light exhibited by the arrangement of its crystalline structure. A variety from Siberia is called *sunstone* by jewellers, and to this variety the avanturine felspar of Archangel appears to belong.

ADVENTI'TIOUS (*advenio*, to come to). Accidental; casual; abnormal; that which comes from some unusual source. In botany, it denotes any thing developed out of the ordinary course, as aerial roots, extra-axillary buds, &c.

A'DVERB (*ad*, to, *verbum*, a word). In grammar, a word which qualifies a verb, adjective, participle, or even another adverb, and generally indicates *time*, *place*, *quantity*, or *manner*. The adverb is closely related to the adjective, and seems to have been originally contrived to express compendiously in one word what must otherwise have required two or more.

ÆO'LIAN HARP (*Æolus*, the god of the winds). A musical instrument consisting of a simple box of wood, with four or five strings, two or three feet long, fastened at each end. These are tuned in unison, so that, when made to vibrate with force, they produce the same tones. But, when suspended in a gentle breeze, each string, according to the manner of force in which it receives the blast, either sounds as a whole, or is divided into several parts.

Æ'OLIPILE (*Æoli pila*, ball of Æolus). A steam globe, or hollow sphere of copper or brass, with a small orifice for the insertion of a tube, for illustrating both the mechanical and thermal properties of steam.

ÆPI'NUS'S THEORY. A theory by which the phenomena of magnetism are referred to the agency of a peculiar fluid, having properties very similar to those of the electric fluid in the hypothesis of Franklin, but which act only upon ferruginous bodies and nickel. The particles of this fluid repel one another with a force which decreases as the distance increases, and they are attracted by the particles of iron with a force varying according to the same law. This theory further requires the supposition that the particles of iron repel one another according to the same law.

ÆQUILA'TERAL (*æqua latera* habens). Having equal sides, as applied to triangles which have all their sides equal.

AERA'TION (*aer*, air). The impregnation of a liquid with carbonic acid gas; or simply the saturation of a liquid with air.

AERIAL ACID (*aer*, air). A name

given by Bergmann to carbonic acid, from an idea that it entered into the composition of atmospheric air.

A'ERIFORM (*aer*, air, *forma*, likeness). Air-like; a term applied to gaseous fluids, from their resemblance to common air. See *Gas*.

A'ERO-DYNA'MICS (ἀὴρ, ἀέρος, air, δύναμις, power). The science which treats of the motion of the air, and of the mechanical effects of the air in motion.

A'EROGRAPHY (ἀὴρ, ἀέρος, the air, γράφω, to describe). A description of the nature, properties, and limits of the atmosphere.

A'EROLITE (ἀὴρ, ἀέρος, air, λίθος, a stone). A meteoric stone, or mineral mass, which falls through the air, accompanied with the disengagement of light, and a noise like thunder. These masses invariably contain iron, cobalt, or nickel, or a combination of these three metals, in union with various earthly substances. They have a specific gravity of from 3.3 to 4.3, and are more or less magnetic.

AERO'METER (ἀὴρ, ἀέρος, air, μέτρον, a measure). An instrument constructed by Dr. M. Hall, for ascertaining the changes in the temperature of the atmosphere; in the barometrical pressure; in the external and internal heights of the fluid in the pneumatic trough; and, when this trough contains water, for the elevation and precipitation of aqueous vapour.

A'ERONAU'TICS (ἀὴρ, ἀέρος, air, ναυτικὸς, belonging tc ships). The art of navigating the air, by means of a balloon.

A'EROPHYTES (ἀὴρ, ἀέρος, the air, φυτὸν, a plant). Plants which live exclusively in air, as distinguished from *hydrophytes*, which live in water.

AERO'SCOPY (ἀὴρ, ἀέρος, air, σκοπέω, to observe). The observation of the air.

A'EROSTAT (ἀὴρ, ἀέρος, the air, στάσις, a standing). An air-balloon, or hollow sphere, composed of flexible and air-tight materials, and filled with some elastic fluid whose specific gravity is much less than that of atmospheric air. See *Montgolfier*.

A'EROSTA'TICS (ἀὴρ, ἀέρος, air, στάσις, a standing). The science which treats of the equilibrium of air and other elastic fluids.

A'EROSTA'TION (ἀὴρ, ἀέρος, the air, στάσις, a standing). A science depending on the statical operations of our atmosphere, and exhibited in raising heavy bodies into the air, by the buoyancy of gases of small specific gravity. In other words, it is the science which teaches the equilibrium of bodies supported in air.

ÆRU'GO (*æs*, copper). Verdigris; an impure subacetate of copper, formed by placing plates of the metal in contact with the vapours of vinegar.

Æ'SCULA'CEÆ. The Horse-Chestnut tribe of Dicotyledonous plants, named from the genus Æsculus. Trees or shrubs, with *leaves* opposite; *flowers* unsymmetrical; *stamens* 7 or 8, unequal, hypogynous; *ovary* 3-celled; *fruits* 1-2 or 3-valved; *seeds* large, with a broad hilum, exalbuminous.

ÆSTHE'TICS (αἴσθησις, perception). That science which refers the first principles in the arts to sensation and sentiment, as distinguished from mere instruction and utility. "Art," says Menzel, "is not the result of understanding alone; the inspiration of the artist has been, and ever must be, the source of that which gives æsthetic value to his productions."

ÆSTIVA'TION (*æstivus*, belonging to summer). *Præfloration.* A botanical term, denoting the manner in which the floral envelopes are arranged with respect to each other, before their expansion Thus, in the Umbelliferæ, the æstivation is *valvate;* in Rosa, it is *quincuncial;* in papilionaceous flowers, it is *vexillary*, &c. See *Vernation.*

Æ'STUARY (*æstuarium*, a firth). An arm of the sea in which the tide ebbs and flows. A channel of a river contiguous to the sea, in which the influence of the tides is perceptible, without distinct current.

Æ'THEO'GAMOUS (ἀήθης, unusual, γάμος, marriage). A term applied to what are otherwise called cryptogamous plants, from the notion that their mode of reproduction is of an *unusual* rather than of a hidden nature. The term would be more correctly written *aëtheogamous.*

ÆTHER (αἰθὴρ, ether). A highly limpid, volatile, and inflammable fluid, produced by the action of acids on alcohol.

Æ'THIOPS (αἴθω, to burn, ὢψ, the eye or countenance). A designation of various chemical compounds, derived from their black appearance, resembling that of the Æthiop. Thus we have *æthiops mineral*, or the black sulphuret of mercury; *æthiops per se*, or the grey oxide of mercury; *æthiops martial*, an old name of the deutoxide of iron; and *vegetable æthiops*, a species of charcoal, prepared by burning the fucus vesiculosus in the open air, and reducing it to a black powder.

ÆTHOGEN (*αἴθων*, brilliant, *γείνομαι*, to become). A compound of boron and nitrogen, lately discovered by Mr. Balmain. It gives a brilliant phosphorescent light when heated before the blowpipe.

ÆTHRIOSCOPE (*αἰθρία*, serene weather, *σκοπέω*, to examine). An instrument invented by Sir John Leslie for indicating the power of the clouds in preventing radiation. It consists of the differential thermometer, having one of the balls excluded from the light, and the other placed in a polished metallic cup. Exposed to a clear part of the sky, the heat radiated from it escapes rapidly, and the temperature falls; exposed to a cloud, the radiated heat is restored, and there is no reduction of temperature.

ÆTIO'LOGY (*αἰτία*, a cause, *λόγος*, a treatise). That branch of medical science which treats of the causes of disease.

AETI'TES LAPIS (*ἀετὸς*, an eagle). Eagle-stone; a variety of iron ore, so called from the belief that it was found in the nest of the eagle, where it was supposed to prevent the eggs from becoming rotten.

AFFINITY, CHEMICAL (*affinitas*, relationship). That kind of attraction by which certain substances, when placed in contact, exhibit a tendency to combine with each other, forming compounds differing in all their essential qualities and actions from their constituent ingredients, and constituting distinct species of matter. The actual phenomena of combination suggest the idea of peculiar attachments and aversions subsisting between different bodies; and it was in this figurative sense that the term *affinity* was first applied by Boerhaave to a property of matter.

1. *Single affinity* is the property by which two elementary bodies combine, as when oxygen combines with lead, forming a white oxide.

2. *Single elective affinity* is the property by which a body exhibits a preference in combining with another, rather than with a third, a fourth, &c. Thus nitric acid has an affinity for magnesia; it has also an affinity for lime; but, on mixing these three substances together, *only one* of the affinities is obeyed: the nitric acid combines with the lime, leaving the magnesia altogether unaffected.

3. *Double elective affinity* is the property by which two compounds are decomposed, and a double affinity exhibited. Thus, when carbonate of soda is added to nitrate of lime, carbonate of lime is instantly formed and precipitated, nitrate of soda being formed at the same time and remaining in solution. This is a case of *complex affinity*, connected with *double decomposition.*

4. *Reciprocal affinity* is the property by which bodies, which have no tendency to unite, are made to combine by means of a third, which is then called the *medium.* Thus, on introducing a clean plate of platinum into a mixture of oxygen and hydrogen gases, the gases in contact with the metallic surface instantly unite and form water. This has been termed *disposing affinity*, and the *affinity of intermedium.*

5. *Quiescent* and *divellent affinities* are terms introduced by Kirwan. The former is that property which prevents decomposition, by maintaining the elements of a compound body in their existing state. The latter favours decomposition, by tending to arrange the particles of a compound in a new form.

6. *Elementary affinity* is that which takes place between the elements of a body. *Resulting affinity* occurs only in a compound, having no existence with the elements of that compound.

7. *Inductive* or *current affinity* is a term expressive of the peculiar exhibition of chemical affinity in the simple voltaic circle. The idea of any thing like a circulation of *electricity* in this case appears to be abandoned, the phenomena admitting of a perfectly intelligible explanation when referred to ordinary chemical affinity exerting its influence at a distance, by an *inductive* or *circulating* agency.

AFFI'RMATIVE. A term employed in logic to denote the essential quality of a proposition: this quality is *affirmative* when the copula asserts an agreement between the predicate and the subject; *negative*, when it denies that agreement. The essential quality of a proposition is therefore determined by the copula.

1. An *affirmative quantity* in algebra is a positive quantity, or a quantity to be added, as distinguished from a *negative* quantity, or a quantity to be deducted.

2. An *affirmative sign*, or a positive sign, is a sign of addition, and is marked +, signifying *plus*, or more. See *Algebraical signs.*

A'FFIX (*affigo*, to fasten to). *Suffix.*

In grammar, a particle added to a word, to diversify its form, or alter its signification; as art*ful*, wealth*y*, strength*en*, convul*sion*, &c. See *Prefix*.

AFFLU'XUS (*affluo*, to flow to). *Forma specifica*. Names given in former times to a supposed reciprocal influence of terrestrial bodies; it was compared to the effect of a magnet on iron, and of amber on chaff.

AGA'LMATOLI'TE (ἄγαλμα, an image, λίθος, a stone). *Bildstein*, or *figure-stone*. A massive mineral, of a grey, brown, flesh-red colour, sometimes spotted, or with blue veins. It has been called *steatite pagodite*, from its being carved by the Chinese into grotesque figures. It is found at Naygag in Transsylvania, and Glyderbach in Wales.

AGA'MIDÆ (*agama*, the name of a lizard). The first section, according to Cuvier, of the Iguanian Sauria, characterized by the absence of palatal teeth. All the agamoïd lizards possess the property of changing their colour; and from this circumstance, perhaps, the name (ἄγαμαι, to wonder at) is derived.

A'GAMOUS (α, priv., γάμος, marriage). Sexless; a term applied by some botanists to what are more commonly called *cryptogamous* plants, from the notion that they possess *no sexual* characters—that they are absolutely destitute of stamen and pistil.

A'GARIC (*Agaria*, a kingdom of Sarmatia). The generic name of the Mushroom tribe of the Fungi which grow in decaying animal or vegetable matter.

AGARIC MINERAL. One of the purest of the native carbonates of lime, found in clefts of rocks, and named from its resemblance to the agaric in texture and colour. It has been considered as a variety of *meerschaum*. The Germans call it *bergmehl*, or mountain meal; the Italians, *latte di luna*, or moon-milk. It is the argillo-murite of Kirwan, the talc pulverulent silicifere of Haüy.

AGA'STRICA (α, priv., γαστὴρ, the stomach). Stomach-less; a term applied to certain animalcules, which were supposed to be devoid of internal digestive cavities.

A'GATE (Ἀχάτης, the name of a river in Sicily). A genus of semi-pellucid gems, consisting of a basis of chalcedony, with variable proportions of jasper, amethyst, quartz, opal, heliotrope, and cornelian. The finer varieties are termed oriental; the most beautiful British specimens are known by the name of *Scotch pebbles*, and sometimes, from their locality, *Cairngorms*.

1. *Ribbon agate* consists of alternate and parallel layers of chalcedony with jasper, quartz, or amethyst. The most beautiful specimens come from Siberia and Saxony. It occurs in porphyry and gneiss.

2. *Brecciated agate* consists of a base of amethyst, containing fragments of ribbon agate. It is of Saxon origin.

3. *Fortification agate* is found in nodules of various imitative shapes, imbedded in amygdaloid. This occurs at Oberstein on the Rhine, and in Scotland. On cutting it across, and polishing it, the interior zig-zag parallel lines bear a considerable resemblance to the plan of a modern fortification. In the very centre, quartz and amethyst are seen in a splintery mass, surrounded by the jasper and chalcedony.

4. *Mocha stone* is a translucent chalcedony, containing dark outlines of arborization, like vegetable filaments, supposed to arise from mineralized plants of the cryptogamous class. It is found in Arabia.

5. *Moss agate* is a chalcedony with variously-coloured ramifications of a vegetable form, occasionally traversed with irregular veins of red jasper. In this and the preceding species, aquatic confervæ have been discovered. *Ure.*

A'GGREGATE (*aggregatus*, herded together). 1. A term applied in *physics* to a body or mass composed of smaller bodies or masses. The smallest parts into which an aggregate can be divided without destroying its chemical properties, are called *integrant* parts. 2. *Aggregate animals* are animals clustered together in a common enveloping organized substance, as the polypes, the acalephæ, and the acephalous mollusca. 3. In botany, the term is applied to parts which are crowded together, as the florets of the compositæ, the carpels of ranunculaceæ, &c.

AGO'MPHIA (α, priv., γόμφος, a grinder). Toothless animals; a term applied by Ehrenberg to those rotifera whose jaws are deprived of teeth.

AGO'NIC LINES (α, priv., γωνία, an angle). The name given by Prof. August to some lines existing on the surface of the earth, on which the horizontal needle points to the true north; in other words, where the magnetic meridian coincides with the geographical. These *lines of no declination* are two in number: one, called the *American agone,* is in the western hemisphere; the other, or *Asiatic,* is in the eastern hemisphere. They extend from south to north, but they do not coincide with the meridians; for they both, especially the Asiatic, intersect the latter lines under different angles. See *Isogonic lines.*

AIR (ἀήρ, aër). The general designation of a gas, or permanently elastic fluid. *Ethereal air,* or ether, is an imaginary fluid, supposed to fill all space beyond the atmospheres of the earth and other planets. *Atmospheric air* is the gaseous fluid which surrounds the earth, consisting, when pure, of 20 parts of oxygen, and 80 of nitrogen, with a portion of carbonic acid, varying from 3 to 8 parts in 10,000 by weight. Air which is expanded, or rendered less dense than usual, is said to be *rarefied;* that which has been subjected to pressure, is said to be *condensed.*

AIR-CELLS. A term applied to cavities in the stems and leaves of plants, which, being filled with air, enable the plants to float in water; also to membranous receptacles in birds, by means of which their bodies, being permeated by the atmospheric air, are adapted for flight.

AIR-GUN. An instrument for projecting bullets, resembling a common gun, with the addition of a hollow ball or reservoir, into which air is introduced and condensed by means of a syringe. The effects of the apparatus depend on the elasticity and compression of the air.

AIR-PLANTS. Plants which grow without having their roots within the earth. It was supposed that they were nourished by the air; but their locality in a damp atmosphere, or in contact with other vegetables, rather suggests the usual mode of existence There are two tribes of air-plants, viz., the *Bromeliaceæ* and the *Orchidaceæ.*

AIR-PUMP. An exhausting syringe, or pneumatic apparatus for rarefying the atmospheric air and reducing it to any required degree of tenuity, and at the same time exhibiting the circumstances which attend this change of condition as displayed in other bodies.

AIR-TIGHT. That degree of closeness, in any vessel or tube, which prevents the passage of air.

AIR-VESSEL. A vessel in which air is condensed by pressure, for the purpose of employing the reaction of its elasticity as a moving or a regulating power. The term has also been applied to the *spiral vessels* of plants and to the *tracheæ* of insects.

A'LA. The Latin term for a wing. In Ornithology, it denotes the pectoral extremity, the bones of which support broad folds of skin, covered with feathers, and adapted for flight. In Botany, it is the lateral petal of a papilionaceous corolla.

A'LABASTER (ἀλάβαστρον, a calcareous spar). A stone usually white, resembling marble, but soft enough to be scratched by iron. The term is said to be derived from Alabastron, a town of Egypt. 1. *Gypseous* alabaster is a natural semi-crystalline *sulphate* of lime, forming a compact gypsum of various colours, and employed for making statues and vases. 2. *Calcareous* alabaster is a *carbonate* of lime, deposited by the dripping of water in stalactitic caves, and frequently found as a yellowish-white deposit in certain fountains. The oriental alabaster is of this kind.

A'LALITE. Another name for *diopside* or mussite, a sub-species of oblique-edged augite. It is found at Piedmont, in the black rock at Musa, near *Ali,* in veins, along with epidote or pistacite, and hyacinth-red garnets.

ALA'NGIA'CEÆ. An order of Dicotyledonous plants, named from *Alangium,* the Malabar name of one of the genera. Large trees, with *leaves* alternate; *petals* 5-10; *stamens* 2-4 times as numerous as the petals; *fruit* drupaceous, esculent; *seeds* albuminous, fleshy, pendulous.

A'LANTINE. An amylaceous substance, procured from the root of the Angelica Archangelica, an umbelliferous plant.

ALASMODO'NTINÆ. A sub-family of the *Unionidæ,* unios, or river mussels, named from the genus *alasmodon.*

ALA'TE (*ala,* a wing). Winged; a term applied to any body, as a stem or seed of a plant, which is bordered by a leafy or membranous expansion resembling a wing.

ALAU'DINÆ (*alauda,* a lark). Alaudine birds, or larks; a family of the *Cantatrices* of Macgillivray, intimately allied to the Wagtails on the one hand, and to the Thrushes on the other. They do not belong, according to this author, to the Conirostral or Thick-billed birds, as generally supposed; for their bill is differently formed, and they never shell or husk seeds, but swallow them entire.

A'LBIN (*albus*, white). An opaque white mineral found in Bohemia. It occurs massive in aggregate crystalline laminæ.

ALBI'NO (*albus*, white). A term applied by Dr. Prichard to one of those varieties of mankind, including all individuals or races which have *white* hair, and are also distinguished by red eyes. The term *Albino* is derived from the Portuguese, by whom it was applied to individuals found on the coast of Africa, who resembled the negroes in every respect except in colour. These negroes were also called *Leucæthiopes*, a term denoting white negroes.

A'LBITE. *Soda Felspar*. A silicate of alumina, resembling felspar in its properties, with the substitution of soda for potash. It occurs in crystals under the form of *hemitropes*. These hemitropes are formed when two crystals are so joined to each other, that the upper plane of the one is applied upon the lower plane of the other. See *Cleavlandite.*

ALBU'MEN (*albus*, white). One of the most important proximate principles of animal bodies, existing, in the solid state, in several of the textures of the body, as the cellular membrane, the skin, &c.; and, in the liquid state, constituting the principal part of the white of egg. *Vegetable albumen* closely resembles animal albumen, and appears to be an ingredient of emulsive seeds generally, and to exist in the sap of many plants.

ALBU'RNUM (*albus*, white). The external, last formed, and whiter portion of the wood of exogenous trees. From its being the channel of the ascending sap, it is commonly called *sap-wood*. See *Duramen.*

ALCA'RGEN; ALCA'RSIN. Arsenical compounds derived from acetyl. The former is synonymous with cacodylic acid; the latter, with oxide of cacodyl, and known as the *liquor of Cadet.*

ALCE'DINÆ (*alcedo*, the king-fisher). Alcedine birds, or King-fishers; a family of the order *Jaculatrices* of Macgillivray, of the Insessores of other writers. See *Halcyonidæ.*

A'LCHEMY. The fanciful search after the *philosophers' stone*, by which the baser were to be transmuted into the precious metals; and the *elixir vitæ*, by which human life was to be indefinitely prolonged. Those alchemists who were supposed to be skilled in the art were termed *Adepts.*

A'LCIDÆ (*alca*, the auk). The Auk or Penguin tribe; a family of the *Natatores*, or Swimming birds, which exhibit the most remarkable adaptation of structure for aquatic habits, their short featherless wings being admirable representatives of fins or paddles.

A'LCOATES. Crystalline compounds formed by alcohol with several of the salts which it dissolves. They correspond with hydrates, but are much less stable.

A'LCOHOL. An alchemical term, of Arabic origin, denoting the *essence* of bodies, separated by sublimation from all impurities. It now signifies ardent spirit of wine, as obtained by distillation and subsequent rectification from all liquids which have undergone vinous fermentation. The first product of distillation is called *low wine;* this, on redistillation, becomes *raw spirit*, and, on repeating the process, *rectified spirit.* In its most concentrated state it is termed *absolute alcohol*, and is then free from water.

A'LCOHO'METER (*alcohol*, *μέτρον*, a measure). An instrument, also called *œnometer*, for ascertaining the quantity of alcohol contained in a vinous liquid.

A'LCYONITES. A general term for the fruit-like, spongiform fossils common in chalk formations. They are fossil alcyonia, or zoophytes nearly allied to sponges, the production or habitation of polypi.

ALDE'BARAN. The Arabic name of a star of the first magnitude, marked *α* Tauri, situated in the eye of the constellation Taurus. It is the bright star in the group of the Hyades. It frequently suffers occultation by the moon, when the ascending node is in Virgo, and exhibits the phenomenon of projection on the moon's disk.

A'LDEHYDE. A colourless liquid, formed by the action of oxidating bodies upon alcohol, by which two atoms of hydrogen are abstracted, and the elements of aldehyde left. Its name is derived from the words *al*cohol *dehyd*rogenatus: it is, in fact, alcohol *minus* hydrogen.

ALDERA'MIN. A star of the third magnitude in the northern constellation Cepheus.

ALDHA'FERA. A star of the third magnitude in the constellation Leo.

ALECTO'RIDES (ἀλέκτωρ, a cock). A tribe of gallinaceous or rasorial birds, including the curassow and others which resemble the common fowl in the form of the beak. See *Cracidæ.*

ALE′MBIC. A chemical vessel, employed in distillation, and consisting of a *body, cucurbit,* or *matrass,* which serves as a boiler, and a *head,* or *capital,* with a pipe and receiver.

A′LEMBROTH SALT. A compound of bichloride of mercury and sal ammoniac; the *salt of wisdom* of the alchemists.

A′LGÆ (*alga,* a sea-weed). *Algaceæ.* The Sea-weed tribe of Cellular or Cryptogamic plants. Leafless, flowerless plants, without any distinct axis of vegetation, growing in water. *Reproductive matter,* either absent or contained in the joints of the filaments, or deposited in peculiar thecæ formed in the substance of the frond. *Sporules* without any proper integument.

1. *Jointless Algæ.* These comprise all the broad membrane-like sea and fresh-water species, as well as the large and tough tangles and dulses so common on our coasts. The genera *fucus* and *ulva* belong to this division of algæ.

2. *Jointed Algæ.* These are generally termed *Confervæ,* and comprise the greater number of fresh-water species, and many of marine station. They consist of thread-like jointed tubes.

3. *Disjointed Algæ.* These are characterized by their original or final spontaneous separation into distinct fragments, which have a common origin, but an individual life. They constitute the organic limits of the animal and the vegetable kingdoms.

A′LGAROTH, POWDER OF. An oxichloride of antimony, precipitated on throwing a concentrated solution of the chloride into water, and named after a physician of Verona.

A′LGEBRA. The science which teaches to reason about indeterminate quantities by means of letters of the alphabet, and certain signs and symbols, which are employed to represent both the quantities themselves and the manner in which they are connected with other quantities. It is, in fact, *universal arithmetic.* The term *algebra* is derived from some Arabic words, signifying *restoration and reduction.*

ALGEBRA′IC. An expression is said to be *algebraic,* as distinguished from *transcendental,* when its number of terms is finite, and when each term contains only addition, subtraction, multiplication, and division, and extraction of roots, the exponents of which are given. Thus, all infinite series, as well as expressions containing

$$\log. x,\ a^x,\ \sin. x,\ \cos. x,\ \&c.,$$

though used in Algebra, in the widest sense of the word, are properly said to be not *algebraic,* but *transcendental.* Similarly, a curve is said to be *algebraic* when its equation contains no transcendental quantities.

ALGEBRA′IC CURVE. A curve of which the relation between the abscissa and the ordinates is expressed by an *algebraic equation,* or an equation of which the terms contain only algebraic quantities. This is also called a geometrical curve, in contradistinction to a mechanical or transcendental curve.

ALGEBRAIC GEOMETRY. A name given to the application of Algebra to the solution of geometrical problems.

ALGEBRA′ICAL SIGNS. Certain signs used in algebraical and mathematical operations, to denote the relation of numbers, magnitudes, and quantities. The characters with which they are used are either the arithmetical figures, as denoting numbers, or the letters of the alphabet, as denoting magnitudes or quantities. The explanation of these signs is as follows:—

$=$ *Equality,* denotes that the numbers or quantities between which it is placed are equal to each other: as 2 and $2 = 4$.

$+$ *Addition,* generally called *plus,* a Latin word for *more:* it denotes that the numbers, or quantities between which it is placed, are to be added together: as $3 + 2$, or 3 *more* 2, are equal to 5; or $3+2=5$.

$-$ *Subtraction,* called *minus,* meaning *less:* it is placed between numbers or quantities, and denotes that the number, &c., placed after it, is to be subtracted from that which is before it· as $5 - 2 = 3$.

$\times$ or $\cdot$, *Composition,* or *Multiplication,* denotes that the numbers between which it is placed are to be *multiplied* by each other, or together: as 5×3, or $5 \cdot 3 = 15$. In numbers it is best to use $\times$, as $\cdot$ is apt to be mistaken for a decimal point. With letters it is indifferent which is used; and single letters are understood to be multiplied where there is *no sign* between them: as $a\,b$ denotes the product or result of the multiplication of the two numbers represented by a and b. Numbers multiplied together are called *factors.*

$\div$ *Resolution*, or *Division*, denotes that the number before it is to be *divided* by the number after it: as $15 \div 3 = 5$. When the number after the sign is greater than that before it, the quotient, or result of the division, cannot be expressed in a common number, because it is less than 1, which is the least common number. In these cases the quotient is indicated by placing the number to be divided above a line, and the divisor below. Thus the quotient of $3 \div 4$ is expressed by $\frac{3}{4}$. When we require only to express the division and not perform it, the fraction is sufficient: as $\frac{15}{3}$ is the same as $15 \div 3$. Arithmetical operations cannot be performed with letters, and thus the fraction is the only form in which we can point out the dividing of one letter by another: as $\frac{a}{b}$ is the only way in which we can express the quotient of $a \div b$.

$:$ *Ratio*, denotes that the numbers or quantities between which it is placed have some relation or proportion to each other. In expressing ratios that are equal, instead of $=$, the usual sign of equality, $::$ is used. Thus the expression $a : b :: c : d$, means that as a is to b so is c to d; and $2 : 4 :: 6 : 12$; as 2 is to 4 so is 6 to 12. Any one relation of the magnitude or value of one thing, or quality, is called a *ratio*.

$>$ *Majority*, denotes that the number or quantity which is placed before it is greater than that which follows: as $a > b$, that the quantity expressed by a is greater than that represented by b.

$<$ *Minority* is the reverse of majority, as $c < d$ expresses that the quantity c is less than that of d.

$=$, $>$ and $<$, are used to denote the relations of ratios, or proportions, as well as of single numbers and quantities: thus $a : b = c : d$, means that a is the same part or portion of b that c is of d; $a : b > c : d$, means that a is a greater part of b than c is of d; and $a : b < c : d$, means that a is a less part of b than c is of d. The same may be expressed by making the first, or *antecedent* term of each ratio, numerator of a fraction, and the last or *consequent* term, denominator. Thus $\frac{a}{b} = \frac{c}{d}$, $\frac{a}{b} > \frac{c}{d}$, and $\frac{a}{b} < \frac{c}{d}$, are respectively the same as, $a : b = c : d$, $a : b > c : d$, and $a : b < c : d$. When ratios vary, the signs are conveniently written $\overset{\cdot}{\underset{\cdot}{=}}$, $\overset{\cdot}{\underset{\cdot}{>}}$, $\overset{\cdot}{\underset{\cdot}{<}}$.

—— *Connexion* (*vinculum*, or tie) drawn over numbers or quantities, connected by signs, or the enclosing of such between parenthetical characters, denotes that they are to be taken as *one*, that is, as the single number or quantity that would result after all the operations were performed. Thus, $\overline{8+6 \div 7}$, or $(8+6) \div 7$, denotes that the sum of 8 and 6 is to be divided by 7, and is the same as $\frac{14}{7}$, or 2; but $8+6 \div 7$, without the sign of connexion, is $8\frac{6}{7}$. Again, $\overline{24 - 3 \times 8}$, or $(24-3) \times 8$, is the same as 21×8, that is, 168; but if the sign of connexion be taken away, it becomes $24-24$, or 0.

^{n} *a Power*. A number or letter written over the right of another in a smaller character is called an *exponent*, and denotes that the number or letter over which it is written is understood to be used as a factor in multiplication as often as is expressed by the exponent. Thus 4^3 is the same as $4 \times 4 \times 4$, or 64. An expression of this kind is called a *power* of the number or quantity to which the exponent is affixed, and that number or quantity is called the *root*. The performing of the multiplications is called *involution;* and the number of multiplications is always one less than the number expressed by the exponent, because *two* factors are required for the first multiplication, and one additional factor for every succeeding one. If the root consist of several numbers or letters, they must be inclosed in parentheses, or placed under a *vinculum*.

$\sqrt[n]{}$ *a Root*. When a number or letter is considered as a *power*, the root of it is denoted by placing the sign $\sqrt{}$ before it, and writing the exponent over the sign, in the place of the small letter *n:* thus $\sqrt[3]{64}$ is the third root of 64, that is, it is 4. If the power consist of several numbers or letters, they must be connected. Thus, $\overline{\sqrt[2]{}4 + 12}$, or $\sqrt[2]{}(4 + 12)$, is 4; but $\sqrt[2]{}4+12$, without the connexion, is 14. For the *second* root, or, as it is called, the *square* root, the sign is used without the exponent: as $\sqrt{9}=3$. Roots are also expressed by

Alhidade

fractional exponents, over the right: as $a^{\frac{1}{3}}$ is the same as $\sqrt[3]{a}$.

∞ *Indefinitude*, denotes that the quantity before which it is put, is greater or less than any value that can be assigned: as $\frac{1}{0}$, or $\frac{0}{1}$.

A'LGENIB. A star of the second magnitude, on the right side of Perseus.

A'LGOL. *Medusa's Head*. A variable star in the constellation Perseus.

A'LGORAB. A star of the third magnitude, in the right wing of Corvus.

A'LGORITHM. An Arabic term expressing numerical computation, and now generally used to denote the operative part of arithmetic or of algebra.

A'LIFORM (*ala*, a wing, *forma*, likeness). Wing-like; shaped like a wing.

A'LILADE. An Arabic term for the index which traverses the centre of an astrolabe or quadrant, carrying the sights or telescope, and indicates on the limb of the instrument the number of degrees and minutes which an object is elevated above the horizon.

A'LIQUOT PART (*aliquot*, some). A number which divides a given number without leaving a remainder: thus, 2, 4, 5, and 10 are aliquot parts of 20. All the aliquot parts of any number may be thus found:—divide the given number by its least divisor; then divide the quotient also by its least divisor; and so on, always dividing the last quotient by its least divisor, till the quotient 1 is obtained; all the divisors thus taken are the prime aliquot parts of the given number.

ALISMA'CEÆ. The Water-Plantain tribe of Monocotyledonous plants, named from the genus *Alisma*. Floating plants, having *leaves* with parallel veins; *petals* and *sepals* 3; *stamens* definite or indefinite; *ovaries* superior; *fruit* dry, indehiscent; *seeds* exalbuminous; *embryo* shaped like a horse-shoe.

A'LIZARIN. A peculiar colouring principle obtained from madder, and named from *alizari*, the commercial name for madder in the Levant.

AL'KAHEST. An Arabic term, denoting the pretended universal solvent or menstruum of the old chemists.

ALKALE'SCENT. A term applied to substances on which alkaline (ammoniacal) properties are beginning to be developed.

ALKALI PRUSSIAN. *Phlogisticated alkali*. A name formerly given to a fixed alkali, when ignited with some animal substance, and lixiviated. It is found to be in a great measure saturated with Prussic acid.

A'LKALIES (*al*, the Arabic definite article, and *kali*, the name of a plant from which the alkali is obtained by burning, and an old name for potash). A class of bodies, which possess a strong acrid and powerfully caustic taste, and exercise a corrosive action upon all animal matter; they turn the infusions of blue vegetable colours to green, and combine with the various acids, forming an extensive class of compounds called salts. There are three alkalies:

1. The *Vegetable*, or Potash,
2. The *Mineral*, or Soda,

or *fixed* alkalies, being *left* in the ashes of inland and marine plants respectively.

3. The *Animal*, or Ammonia, or *volatile* alkali, being *raised* by distillation from hartshorn, &c.

ALKALI'METRY (*alkali*, and μέτρον, a measure). The method by which the value of the alkalies, or carbonated alkalies, is determined. By means of an instrument, called an *alkalimeter*, the quantity of alkali in a given substance is ascertained by the quantity of dilute sulphuric acid of a known strength which a certain weight of them can neutralize.

A'LKALINE AIR. The term by which Priestley first described ammonia, or ammoniacal gas, the volatile alkali.

A'LKALINE EARTHS. A term applied to magnesia, lime, baryta, and strontia, from their earthy character and alkaline properties.

ALKALI'NITY. The property of an alkali, viz. that of turning vegetable blues into green.

ALKALIZA'TION. The impregnation of any substance with an alkali.

A'LKALOIDS (*alkali*, εἶδος, likeness). *Vegeto-alkalies*. A general term for certain bodies containing nitrogen, which have the properties of the basic or metallic oxides, and form salts with acids. They are produced in plants during vegetation.

A'LKANET. A reddish purple dye, obtained fron the roots of the Anchusa tinctoria.

A'LKER. A star of the third magnitude in the constellation Crater.

A'LLAGITE A mineral of a brown or green colour, consisting of a carbo-silicate of manganese.

A'LLANITE. A mineral containing *cerium*, found in Greenland, and named from Mr. Allan.

ALLA'NTOIC ACID (*allantois*, a membrane situated between the amnion and the chorion). A white crystallizable acid, described by Vauquelin under the name of *amniotic* acid, and said to exist in the liquor amnii of the cow. This fluid contains a crystalline substance called *allantoin*.

A'LLEGORY (ἀλληγορία, a description of one thing under the image of another). In Rhetoric, a figurative representation by which some meaning is signified beyond what is expressed: as in the "Fairy Queen" of Spenser, and Swift's "Tale of a Tub."

ALLE'GRO. An Italian adjective, signifying *gay*, *sportive*, and denoting, in music, quick time. *Allegretto* is a diminutive of allegro, and denotes a tune rather quick and sportive, but less so than that indicated by the term allegro.

ALLIA'CEOUS (*allium*, garlic). A term applied to any thing which has the odour of garlic. In botany, it denotes plants which partake of the properties of garlic or of the onion.

ALLIGA'TION (*alligo*, to bind together or unite). A rule in arithmetic, applied only in commerce, by which the price of a mixture is found, when the price of the ingredients is known. *Medial alligation* is the method of finding the rate or quality of a compound, from the given rates and quantities of the ingredients. *Alternate alligation* is the method of finding the quantities of ingredients necessary to form a compound of a given rate.

A'LLIOTH. A star of the third magnitude in the tail of the Great Bear.

ALLITERA'TION (*ad*, to, *litera*, a letter). In composition, the frequent recurrence of the same letter at the commencement of words, as in the line of Churchill,

"And apt alliteration's artful aid."

A'LLOCHRO'ITE (ἄλλος, another, χρόα, colour). A mineral allied to the garnet, exhibiting several changes of colour, when melted with phosphate of soda before the blowpipe.

A'LLOPHANE (ἄλλος, different, φαίνομαι, to appear). A mineral of a blue, green, or brown colour, formerly called *Riemannite*, and found in a bed of iron-shot lime-stone in Greywacke slate, in the forest of Thuringia.

A'LLOTROPIC STATE (ἄλλος, another, τρόπος, condition). A term applied to the dissimilar condition observed in certain elements of which the various forms of carbon, as diamond, graphite, &c., afford a well-known example. This is one of the causes of the isomerism of their compounds.

ALLO'XAN; ALLOXA'NTIN. Compounds containing cyanogen and carbonic oxide, and discovered in the decomposition of uric acid. *Alloxan* is another name for the erythric acid of Brugnatelli. *Alloxanic acid* is produced by the metamorphosis of alloxan by caustic alkalies.

ALLO'Y (*alloyer*, French, to mix one metal with another, for the purpose of coinage). A natural or artificial compound of two or more metals, as brass, bell-metal, bronze, &c. But the term is not employed when mercury enters into the compound; it is then called an *amalgam*.

ALLU'VIUM (*alluo*, to wash upon). A general designation of earth, sand, gravel, stones, and other transported matter, which have been washed away and thrown down by rivers, floods, or other causes, upon land not *permanently* submerged beneath the waters of lakes and seas.

Alluvial Deposits. These are divided by many authors into two kinds. 1. *Old Alluvium*, or *Diluvium*, which is generally referred to the tertiary series, and often contains remains of animals, more or less resembling those living at the present day. 2. *Recent Alluvium*, or deposits of the same nature, but produced by causes which are in operation at the present day.

ALMAAC. A star of the second magnitude in the northern constellation Andromeda

ALMACA'NTER. An Arabic term formerly employed in astronomy to denote a small circle of the sphere parallel to the horizon. Two stars which have the same almacanter, have the same altitude, and hence the term almacanter signifies a circle of altitude, just as a small circle parallel to the equator, all whose points have therefore the same declination, is called a circle of declination.

A'LMANAC. An Arabic term signifying *reckoning*, and applied to a calendar, wherein the days of the month, festivals, lunation, motion of the heavenly bodies, eclipses, &c., are reckoned for each year. See *Era*.

A'LMANDINE. A designation of precious or noble garnet, occurring in primitive rocks and primitive metalliferous beds, and used for ring-stones.

ALOE'TIC ACID. The bitter principle of aloes; a precipitate procured by heating nitric acid on aloes.

ALPHABET. A term derived from the first two letters of the Greek language, *alpha*, *beta*, or from the corresponding Hebrew letters, *aleph*, *beth;* and applied to the series of letters used in different countries. The term corresponds with our familiar expression, the *A*, *B*, *C;* and some writers have assigned an analogous origin to the Latin name given to the letters, viz. *elementa*, which corresponds with the pronunciation of the three liquids, *l*, *m*, *n*.

ALPHAORCEIN; BETAORCEIN. Terms applied by Dr. Kane to two substances composing the orcein of archil: the latter is produced by oxidation of the former, and is the orcein of chemists.

A'LPHERATZ. A star of the second magnitude in the head of Andromeda.

ALPHO'NSINES. A series of astronomical tables drawn up by order of Alphonso X. of Castile, in the year 1252. They contain the places of all the fixed stars, and all the methods and tables then in use for the computation of the places of the planets.

ALPINE PLANTS. Plants which grow naturally in mountainous situations, where they are covered with snow during the winter.

ALSINA'CEÆ. The Chickweed tribe of Dicotyledonous plants. A section of the Caryophyllaceæ, in which the sepals are disunited. See *Silenaceæ*.

A'LTAN. A star of the first magnitude in the northern constellation Aquila, the eagle with Antinous.

A'LTERATIVES (*altero*, to change). Remedies which *produce a change*. Remedies which very gradually re-establish the health, as a drop of water, by frequently falling, hollows a stone.

ALTE'RNATE (*alternatus*, changed by turns). A term applied in geometry to the angles which are made by two lines with a third, on opposite sides of it. In algebra, those terms of a proportion are said to be alternate, which are separated from one another by another term: thus, in the proportion

$$2 : 4 :: 8 : 16,$$

2 and 8 are alternate terms, as also are 4 and 16. If alternate terms be rendered consecutive, and consecutive terms alternate, the proportion is still maintained: thus,

$$2 : 8 :: 4 : 16.$$

This relation is referred to in the fifth book of Euclid by the Latin word *alternando*, which signifies "by alternation," or alternately.

1. *Alternate, in Botany*. That position of leaves upon the stem, in which one leaf is placed above or below another, and on the opposite side. The term is generally employed in distinction to *opposite*, or that arrangement in which two leaves are developed from the same plane.

2. *Alternately pinnate*. A term used in botany, where the leaflets of a pinnate leaf are placed alternately on the common petiole, as in potentilla rupestris.

ALTHE'INE. A supposed new vegetable principle, extracted from the roots of *althea officinalis*, and found to be identical with *asparagin*.

ALTHIO'NIC ACID. An acid found in the residue of the preparation of olefiant gas, by means of alcohol and sulphuric acid, and named from the words *alcohol* and *ethionic*.

A'LTITUDE (*altus*, high). A term applied in Astronomy to the *angle* of elevation of a celestial body above the horizon, measured in the arc of that vertical circle which passes through the body.

1. The *apparent altitude of a star* is the angle found by immediate observation; the *real altitude* is ascertained by correcting the apparent altitude for refraction, parallax, &c.

2. The *altitude of the pole* is the geographical latitude of the place of observation, and remains the same throughout the twenty-four hours.

3. In Geometry, the term *altitude* is synonymous with *height*. Thus, the altitude of a triangle is measured by the straight line drawn from the vertex perpendicular to the base; that of a cone, by the straight line drawn from the vertex perpendicular to the plane of the base; that of a parallelogram, by the perpendicular drawn from its base to the opposite side; that of a prism, by the perpendicular distance between its bases.

A'LUDEL. A pear-shaped vessel resembling the alembic, and used by the old chemists in the process of sublimation.

A'LULA (dim. of *ala*, a wing). A little wing.

A'LUM. *Alumen*. A salt consisting of a ternary compound of alumina, or pure argillaceous earth, potass, and sulphuric acid. Alum is the base of pure clay. The indurated beds of clay employed for obtaining the alum are called *alum-stone*, a siliceous subsulphate of alumina. *Alum-slate* is a rock, from which alum is prepared.

Rock alum is a variety of alum brought from Roccha, formerly Edessa, in Syria *Roman alum* is the purest variety of alum, containing no ammonia in its composition. *Ammonia alum* is a double salt, consisting of the sulphates of ammonia and of alumina. *Soda alum* is a double salt, consisting of the sulphates of alumina and of soda. *Iron alum*, *manganese alum*, and *chrome alum* are salts of alumina, to which the generic term alum is applied, their specific differences being denoted by the name of the metallic peroxide which they respectively contain.

ALU'MINA. The earthy oxide of aluminum; a primitive earth, constituting the plastic principle of all clays, loams, and boles, and hence termed argil, or *argillaceous earth*. The name alumina is derived from *alumen*, or alum, the salt from which it is generally obtained in a pure state.

ALU'MINITE. The name by which mineralogists designate the native hydrated subsulphate of alumina.

ALU'MINUM. A metallic substance resembling platinum, constituting the base of alumina, and obtained from its chloride by the action of potassium.

ALUTA'CEOUS (*aluta*, tanned leather). Of a pale brown colour, like that of tanned leather.

A'LVEOLATE (*alveolus*, a socket or cavity). A term applied in Botany to a surface covered with cavities, as the receptacle of some species of the Compositæ.

A'MADOU. A variety of the *boletus igniarius*, found on old ash and other trees. By means of nitre it is converted into *German tinder*.

AMA'LGAM (ἅμα, together, γαμέω, to unite). A compound of mercury with other metals. A *native amalgam*, which is of silver, occurs in Hungary and Sweden, in various forms. The amalgam employed in electrical apparatus consists of one part of tin, two of zinc, and six of mercury, mixed with some unctuous matter, and spread on silk or leather.

AMA'LGAMA'TION. The process of making an *amalgam*, or mixture of mercury with some other metal, for the purpose of separating silver and gold from their ores. The operation is founded on the property which mercury possesses of dissolving these metals out of the minerals with which they are associated.

AMARANTA'CEÆ. The Amaranth tribe of Dicotyledonous plants. Herbs or shrubs, with *leaves* simple, exstipulate; *flowers* in heads or spikes; *stamens* hypogynous; *ovary* superior; *fruit* a utricle; *seeds* lentiform, with farinaceous albumen; *embryo* curved round the circumference.

AMARYLLIDA'CEÆ. The Narcissus tribe of Monocotyledonous plants. Generally bulbous, sometimes fibrous-rooted, occasionally with a lofty stem. *Leaves* ensiform; *calyx* and *corolla* equally coloured, superior; *stamens* 6; *anthers* bursting inwardly; *stigma* 3-lobed; *albumen* fleshy or horny.

AMA'RYTHRIN (*amarus*, bitter, *erythrin*). A bitter extractive matter procured from erythrin, sometimes termed *erythrin bitter*.

AMAZO'NIAN STONE. A beautiful green felspar, occurring in rolled masses near the Amazon river.

A'MBER. *Succinum*. A hard, brittle, transparent or opaque substance, of an orange colour, considered to be an indurated vegetable juice, or concreted balsam. By destructive distillation of this substance, a light yellow sublimate is procured, called *amber camphor*, or volatile resin of amber.

A'MBERGRIS (*ambre gris*, grey amber). A sebaceous substance supposed to be formed in the intestines of the physeter macrocephalus, or spermaceti whale, and sometimes found floating in the sea, or thrown upon the shore. The Japanese call it *whale's dung*.

A'MBITUS (*ambio*, to encompass). The circumference, or bounding line, of a surface, as of a leaf.

AMBLY'GONITE. A rare mineral, consisting of a phosphate of alumina and lithia, and occurring in granite, in Saxony. It appears to be a species of spodumene.

A'MBREIN. A peculiar substance obtained by digesting ambergris in hot alcohol. By absorption of oxygen it is converted into an acid called *ambreic acid*.

AMBULA'CRA (*ambulacrum*, an alley). The narrow longitudinal portions of the shell of the *echinus*, or sea-urchin, which are perforated by small orifices, traversed by tentacular suckers, and alternated with the broad tuberculate spine-bearing portions.

A'MBULATORY (*ambulo*, to walk).

Formed for walking; as applied to the feet of those birds in which the toes are placed three before and one behind. Such birds were called by Illiger *ambulatores*.

AME'NTUM. A catkin; a form of inflorescence, in which the flowers of a spike are destitute of calyx and corolla, the place of which is occupied by bracts, and the whole inflorescence falls off in a single piece, either after flowering or the ripening of the fruit, as in the hazel and the willow. Plants which have this kind of inflorescence were formerly called *amentaceous*.

AME'RICAN RACE. One of the five principal varieties of mankind, originally spread over the whole of the Americas, south of the sixtieth degree of north latitude. This variety is characterized by a reddish-brown complexion, long black lank hair, deficient beard, eyes black and deep-set, receding brow, cheekbones prominent, but more arched and rounded than in the skull of the Mongolian, aquiline nose, small skull, with the apex high and the back part flat, large mouth, and tumid lips, with fine symmetrical frames of middle height.

AMETA'BOLA (*α*, priv., *μεταβολὴ*, change). A term applied by zoological writers to those genera of insects which do not undergo metamorphoses; which escape from the egg nearly under the same form as they preserve through life, and which, on reaching their perfect state, do not acquire wings. See *Metabola*.

A'METHYST (*α*, priv., *μεθύω*, to be intoxicated). The oriental amethyst is a rare violet-coloured gem, called corundum, or adamantine spar, with the qualities of the sapphire or ruby. The occidental or common amethyst is merely a coloured crystal or quartz. The name is derived from its reputed virtue of preventing intoxication.

AMIA'NTHOIDE. A flexible, filamentous mineral, of an olive green colour, found at Oisans in France.

AMIA'NTHUS (*α*, priv., *μιαίνω*, to corrupt). *Mountain flax.* An incombustible mineral, consisting of very delicate and regular silky fibres. The term appears to have been derived from the circumstance that soiled cloths, made of this substance, are better cleansed by being thrown into the fire, than by washing. See *Asbestos*.

A'MIATITE. *Fiorite*, or *pearl-sinter;* a volcanic production, chiefly silica, in a stalactitical form.

A'MIDES. A series of saline compounds, in which the compound of nitrogen and hydrogen occurs, containing an atom less of hydrogen than ammonia. The term *amidogen* has been applied to their radical.

A'MIDIN (*amidon*, starch). Gelatinous starch; the soluble part of starch; a substance intermediate between gum and starch.

A'MILENE. A liquid hydrocarbon, obtained by distilling hydrate of oxide of amyl repeatedly with anhydrous phosphoric acid.

A'MMELIDE; A'MMELINE. Two of the products of the decomposition of sulpho-cyanogen. See *Melam*.

AMMO'NIA. *Ammoniacal Gas.* A transparent, pungent gas, formed by the union of nitrogen and hydrogen, and named from the substance *sal ammoniac*, of which it constitutes the basis. It has also been termed *alkaline air*, and the volatile alkali.

AMMONI'ACAL AMALGAM. A substance formed by the action of galvanism on a salt of ammonia, in contact with a globule of mercury.

AMMONI'ACO. A term prefixed to the names of salts, in which ammonia has been added in sufficient quantity to combine with both the acid and the base.

A'MMONITE. An extinct and very numerous genus of molluscous animals, called Cephalopoda, allied to the modern genus Nautilus, which inhabited a chambered shell, curved like a coiled snake. Species of it are found in all geological periods of the secondary strata; but they have not been found in the tertiary beds. From its resemblance to the horns of the statues of Jupiter Ammon, it is called *cornu Ammonis;* from its coiled form, it is popularly called *snake-stone*.

AMMO'NIUM. A hypothetical compound of nitrogen and hydrogen. It is not an elementary body, and possibly not even a metal. Berzelius, however, considered it the metallic base of ammonia.

AMMONIU'RET. A compound containing ammonia and a salifiable base, or other substance not acid.

A'MNIOS. In Botany, a gelatinous substance, in which the embryo of a seed is at first suspended. It is subsequently absorbed, or solidified in the form of albumen.

AMNIO'TIC ACID. An acid supposed to be found in the liquor amnii of the cow, but actually belonging to the liquor of the allantois.

AMO'RPHOUS (α, priv., μορφὴ, form). Shapeless, irregular; a term applied to mineral and other substances which occur in forms not easy to be defined.

AMO'RPHOZO'A (ἄμορφος, shapeless, ζῶον, animal). Shapeless animals; a term applied by Blainville to the *Porifera* of other writers, including the sponges.

A'MPELIC ACID. An acid obtained from the oils of bituminous schist. The term *ampelin* denotes an oily matter prepared from the same substance.

AMPE'LIDÆ (*ampelis*, the chatterer). Chatterers; a family of the *Insessores*, or perching birds, or the *Cantatrices* of Macgillivray, distinguished by the enormous width of their gape, which in many extends beyond the eye, and in some is nearly as wide as in the goatsucker. They belong, generally, to tropical America; only one, the *waxwing*, is found in Europe. See *Dentirostres*.

A'MPELITE (ἄμπελος, a vine). A kind of slate, found in the fossiliferous and in the metamorphic series of rocks. The *aluminous* variety is the alum slate; the *graphic*, the graphic slate.

AMPÈRE'S THEORY. An electro-dynamic theory, by which the mutual attraction or repulsion of two magnets is referred to the mutual action of electric currents, according to a certain fundamental law, in a manner resembling the polar attraction of statical electricity, *i. e.* of electricity in a state of tension. In following out this theory, it was supposed by Ampère, that around each particle of a body, which has been constituted a magnet, there is constantly circulating, in a certain stated direction, a small current of electric fluid.

A'MPHI-; A'MPHIS- (ἀμφὶ, ἀμφίς). The former of these prefixes is a Greek preposition, signifying *on both sides*, *around*, that which may be understood in *two ways*. The latter prefix has strictly the same meanings, but is mostly used as an adverb.

1. *Amphi-bia* (βίος, life). The second class of the Vertebrata, comprising animals which commence their larva state as *fishes*, and undergo various stages of metamorphosis in advancing towards the condition of *reptiles*, their most striking peculiarity consisting in the change from aquatic respiration by branchiæ to an atmospheric respiration by true lungs. They are consequently designated as animals having a *double life*.

2. *Amphi-bole.* A silicate of lime and magnesia, otherwise called hornblende. The derivation of this term is, perhaps, ἀμφίβολος, *equivocal*, from the liability of this mineral to be mistaken for augite, which is similarly constituted.

3. *Amphi-bolia* (ἀμφίβολος, equivocal). The "fallacia amphiboliæ" of logicians is seen in those *amphibolous* sentences which are capable of two meanings, not from the double sense of any of the words, but from their admitting of a double *construction*, as in the witch-prophecy of Shakspere, "The duke yet lives that Henry shall depose." This is what the French call "construction louche," a squinting construction; *i. e.* where some word or words may be referred either to the former or latter clause of the sentence.

4. *Amphi-bolites.* Trap-rocks, the basis of which is amphibole or hornblende, a silicate of lime and magnesia. The derivation is the same as that of *amphibole.*

5. *Amphi-gamous* (γάμος, nuptials). A term applied by De Candolle to those cellular cryptogamous plants, which have no trace whatever of sexual organs, as distinguished from the other cryptogamous plants, which, from the unusual character of their fructification, are called *ætheogamous.*

6. *Amphi-gen* (γένος, a kind). A double silicate of potash and alumina, otherwise called leucite or Vesuvian. The name appears to be derived from its composition, the oxygen of the silica being equal to that of the bases.

7. *Amphi-pneurta* (πνέω, to breathe). An order of amphibious animals, including the proteus and the siren, which retain their *gills* during life, and acquire *lungs* in addition by the partial metamorphosis which they undergo.

8. *Amphi-poda* (πούς, ποδὸς, a foot). A group of *crustaceous* animals, which have feet for both walking and swimming. The best known British species is the sand-hopper, which burrows in the sand, and which, unlike most of the group, seldom enters the water.

9. *Amphi-sarca* (σὰρξ, σαρκὸς, flesh). In botany, a compound fruit, many-celled, many-seeded, superior, indehiscent; indurated or woody externally, pulpy internally, as in adansonia.

10. *Amphis-bænidæ* (βαίνω, to walk). Double-walkers; a small family of Ophidian reptiles, intermediate in some respects between the true serpents and the slow-worms. They derive their name

from their power of moving either backwards or forwards with equal facility. The group is restricted to the warmest parts of South America.

11. *Amphi-scians* (σκιά, shadow). A designation of the people who inhabit the torrid zone, and are so called because they have their shadows at noon turned sometimes one way, sometimes another, or north and south—that is, to the north, when the sun at noon is to the south of their zenith, and *vice versâ*.

12. *Amphi-spermium* (σπέρμα, seed). A term applied by Link to a pericarp which is of the same figure as the seed it contains.

13. *Amphi-stoma* (στόμα, the mouth). A genus of suctorial parasitic worms, which have pores, like mouths, at both ends of the body.

14. *Amphi-tropal* (τρόπος, a turn). That which is curved round the body to which it belongs; a term applied to the embryo of the seed, when curved round the albumen, so that its two ends are presented to the same point.

15. *Amphi-tropous* (τρόπος, a turn). A term applied to the ovule of plants, when the foraminal and chalazal ends are transverse with respect to the hilum.

AMPLE'XICAUL (*amplector*, to embrace, *caulis*, a stem). Stem-embracing; as applied to leaves which sheathe the stem, as in many ranunculaceous plants.

A'MPLITUDE (*amplus*, large). A term applied, in astronomy, to the angular distance of a celestial body, at the time when it rises or sets, from the east or west point of the horizon. The amplitude is measured by the arc of the horizon intercepted between the east or west point, and the centre of the celestial body, at the period of its rising or setting on any particular day. See *Horizon*.

Amplitude magnetic. A term applied to the distances of the points of rising or setting, from the east or west, as shown by the compass.

AMPULLA'RINÆ. Apple-snails; a sub-family of the *Turbidæ*, named from the genus *ampullaria:* these animals have a respiratory siphon; the shell is globular or turbinate.

AMY'GDALEÆ (ἀμυγδάλα, an almond). The almond tribe of Dicotyledonous plants, a sub-order of the Rosaceæ. Trees or shrubs with *leaves* alternate; *corolla* polypetalous; *stamens* perigynous; *ovary* superior, solitary, simple; *fruit* drupaceous.

AMY'GDALIN (ἀμυγδάλα, an almond). A principle found in the bitter almond and the berries of the cherry-laurel. By the action of alkalies on amygdalin, an acid is obtained called *amygdalic acid*.

AMY'GDALOÏD (ἀμυγδάλα, an almond, εἶδος, likeness). One of the forms of the Trap-rocks, in which agates and simple minerals appear to be scattered, like almonds in a cake. Such rocks are termed amygdaloidal claystone, amygdaloidal felspar, &c. Also, a compound mineral, consisting of lithomarge, green earth, calc spar, steatite, and sometimes hornblende, imbedded in greenstone or wacke.

A'MYL (ἄμυλον, fine meal, ὕλη, matter or principle). The hypothetical radical of a series of amylaceous compounds, generally considered as an alcohol, from the analogy which exists between oil of potatoes, or hydrate of oxide of amyl, and ordinary alcohol.

A'MYLIC ACID (*amylum*, starch). A volatile acid, procured by digesting moistened starch with peroxide of manganese.

AMYRIDA'CEÆ. An order of fragrant Dicotyledonous plants, named from the genus *Amyris*. Trees or shrubs, with *leaves* compound, with pellucid dots; *corolla* polypetalous; *stamens* hypogynous; *ovary* superior; *fruit* sub-drupaceous, samaroid, or leguminous.

ANACARDIA'CEÆ. The Cashew tribe of Dicotyledonous plants, abounding in a resinous, sometimes acrid, highly poisonous juice. Trees or shrubs with *leaves* alternate; *flowers* usually unisexual; *stamens* perigynous; *ovary* superior; *fruit* generally drupaceous.

ANACOLU'THON (ἀνακολουθέω, not to follow). A grammatical term, denoting a want of sequence in the parts of a sentence. It occurs when the latter part of a sentence does not agree in syntax with the former, which sometimes happens when a parenthetical clause has intervened, so that the author has lost sight of the construction with which he set out.

ANAI'MA (α priv., αἷμα, blood). The name by which Aristotle designated those animals which have no red blood, and which he therefore supposed to be without blood.

ANA'LCIME. A simple mineral of the Zeolite family, also called *cubizite*, of frequent occurrence in the trap-rocks. It is found in grouped crystals deposited by water, in the fissures of hard lavas.

In chemical language, it is the soda silicate proportionate to amphigen.

ANALE'MMA (ἀνάλημμα, a pedestal for a sun-dial). A projection of the sphere on the plane of the meridian, made by straight lines and ellipses, the eye being supposed at an infinite distance, and in the east and west points of the horizon. Also, an instrument of brass or wood, on which the projection is made (the plane of projection being the solstitial colure), with a moveable horizon attached to it.

ANALE'PTICS (ἀναλαμβάνω, to restore). Restoratives; tonic remedies for restoring the health, when it has been impaired by disease or other causes.

ANA'LOGOUS NOUN (ἀνάλογος, according to rule). A logical term, applied to a noun which has only one signification, but admits of being applied in a modified or subordinate sense, to objects which bear no more than an *analogy* or similarity to its original signification: as the noun *sting*—of an animal—of conscience—of an epigram.

A'NALOGUE (ἀνάλογος, according to rule). A body which resembles or corresponds with another body: a recent shell of the same species, as a fossil shell is the analogue of the latter. A part or organ in one animal which has the same function, as another part or organ in a different animal is an analogue of the latter. See *Homologue.*

ANA'LOGY (ἀνάλογος, according to rule). A term denoting, in common acceptation, an imperfect degree of resemblance between different objects. In Geometry it signifies proportion, similitude, or equality of ratios or relations. In Zoology it indicates the relation which animals bear to one another in consequence of their resemblance in the early period of development, or in the less proportion of their organization, and must not be confounded with *affinity:* thus, a whale is analogous to a fish, from its general resemblance and its habitation, but it belongs to the class *Mammalia,* which includes no fishes.

ANA'LYSIS (ἀναλύω, to resolve). A method of instruction, which begins with those objects which are most known; examines their properties and relations; compares them together; traces back effects to causes; and thus proceeds by a path opposite to the course of nature, until it arrives at general principles and laws. This is the process of induction. The *synthetic* method is the reverse of the analytic, as it proceeds from general to subordinate truths, from universals to particulars, from causes to effects.

1. *Geometrical Analysis* is defined by Pappus, as "the course which, setting out from the thing sought, and which for the moment is taken for granted, conducts by a series of consequences to something already known, or placed among the number of principles admitted to be true. By this method, therefore, we ascend from a truth or a proposition to its antecedents; and we call it *analysis,* or resolution, as if indicating an inverted solution. In *synthesis,* on the contrary, we set out from the proposition which is the last in the analysis, and proceed by arranging, according to their nature, the antecedents which present themselves as consequents in the analytic method, and combining them together till we arrive at the conclusion sought."

2. *Chemical Analysis.* The resolution of compounds into their elementary parts. When merely the number and nature of these are ascertained, it is termed *qualitative* analysis; when their proportions also are determined, the analysis is *quantitative.* Every distinct compound, which exists really formed, is called a *proximate* or *immediate principle,* and the process of procuring it is termed *proximate analysis.* The reduction of the proximate principles into their simplest parts constitutes *ultimate analysis.* See *Synthesis.*

ANAMORPHO'SIS (ἀνὰ, again, μόρφωσις, formation). A distorted representation of an object, which is capable, however, of assuming its proper appearance, when viewed in a particular direction or through a particular medium. The figure is also restored, in some cases, by causing the anamorphosis to be reflected from specula with certain surfaces, as those of cones and cylinders. The term *catoptric anamorphosis* is applied to a drawing which has been distorted according to regular laws, in order to produce this effect; and also to its reflected image in a cylindrical or conical mirror.

ANASTA'TIC PRINTING (ἀνίσταμαι, to rise up). A recently invented process for copying from a printed page of any size, from a line engraving, or from any other print, founded on the repulsion of dissimilar, and the mutual attraction of similar, particles, as exhibited by water, oil, and gum arabic. The term is derived from the technical expression of *setting off*, applied to that part of the process by which a slight film of ink is communicated by the copy to a zinc plate.

ANA'STOMOSE (ἀνὰ, through, στόμα, the mouth). A term denoting that the mouths of two vessels come into contact and blend together, or that two vessels unite as if such kind of union had taken place.

A'NATASE. A pure oxide of titanium, having the property of exhibiting various colours by reflected light, from indigo blue to reddish-brown. It occurs in granite, gneiss, mica slate, and transition limestone.

ANA'TIDÆ. The Duck tribe; a family of the *Natatores*, distinguished by a thick bill, which is horny only at its extremity; the remainder of the mandibles being invested with a soft skin, which in other birds is found only at their hinder part. Under the general designation of *ducks*, *geese*, and *swans*, all the birds of this family may be arranged.

ANATI'FIDA. An order of Cirrhopods, named from the genus *anatifa*, and characterized by the peduncle by which the animal is attached to its shell. See *Cirrhopoda.*

ANATOMICAL SYPHON. An apparatus invented by Wolf, for the purpose of illustrating the exertion of a very great pressure, by means of a small quantity of liquid.

ANA'TOMY (ἀνὰ, through, τέμνω, to cut). A term simply meaning *dissection*, but generally applied to the whole science of organization—the science whose object is the examination of the organs or *instruments* of life. Animal anatomy is distinguished into *human* anatomy and *comparative* anatomy, according as it treats of the organization of the human body, or of that of other animals.

ANA'TROPOUS (ἀνατρέπω, to turn upside down). Inverted; turned entirely over; a term applied to the condition of ovules in many plants, as in the apple. The inversion is occasioned by the continued growth of only one side of the ovule, until that portion of it which was originally near the apex is brought down to the hilum; the *base* of the nucleus is then at the *apex* of the ovule.

ANCELLA'RINÆ. An aberrant subfamily of the *Volutidæ*, or volutes, named from the genus *ancellaria*, having the aperture wide, and the base of the pillar alone thickened and striated.

ANDALU'SITE. A massive mineral, of a red colour, first found in Andalusia in Spain.

ANDA'NTE (*andare*, Ital., to go). A term employed in Music, to denote a medium movement between the extremes of slow and quick. See *Adagio.*

ANDRÆA'CEÆ. An order of Cryptogamous plants, named from the genus Andræa. Branching moss-like plants, having a four-valved theca, without operculum or peristome.

ANDRE'OLITE. A mineral first found at Andreasberg, in the Hartz; also called *harmotone*, and, from the form of its crystals, *cross-stone.*

ANDROCE'UM (ἀνὴρ, a man, οἶκος, a house). A term applied to the male apparatus in plants, commonly called the *stamens*—the *apices* of old botanists.

ANDRO'GYNOUS (ἀνὴρ, a man, γυνὴ, a woman). A term applied to a hermaphrodite, or animal which possesses the generative organs of both sexes.

ANDRO'MEDA. A northern constellation, so called by the Greeks from Andromeda, the daughter of Cepheus. It contains sixty-six stars.

ANDRO'PHORUM (ἀνὴρ, a man, φέρω, to bear). A term applied in Botany, by Mirbel, to the tube formed by the union of the filaments in a monadelphous combination, as in passiflora.

ANEMO'METER (ἄνεμος, the wind, μέτρον, a measure). An apparatus for measuring the force of the wind, and indicating its direction at every minute of the day. An exterior vane is connected with an index, which traverses a sheet of paper in a room beneath. The index being influenced by the movements of a clock, and the paper being marked into divisions for every hour of the day, an accurate record is effected

A'NEMOSCOPE (ἄνεμος, the wind, σκοπέω, to examine). An instrument for determining the direction of the wind, and so constructed that the spindle of a weathercock is connected with the hand of a dial on which the points of the compass are marked.

ANE'NTEROUS (α, priv., ἔντερα, bowels). A term applied to the infusorial animalcules, which have no intestinal canal.

ANFRA'CTUOUS (*anfractus*, a winding backward and forward). Spiral; resembling in direction the spire of a corkscrew, as applied in Botany to the direction of a stem; or folded back upon itself, as the anther of cucumis.

ANGEI'OCARPOUS (ἀγγεῖον, a vessel, κάρπος, fruit). A term applied by Mirbel, in Carpology, to those plants which have their fruit seated in envelopes not forming part of the calyx: as the filbert, which is enveloped in a husk; the acorn, which is seated in a cupula.

ANGEI'OSPE'RMIA (ἀγγεῖον, a vessel, σπέρμα, seed). A term applied to all those plants which have their seeds enclosed in a vessel, or pericarp, as distinguished from those which have no such protection, and are termed *gymnospermia*. Thus, the leguminosæ are angeiospermous, the coniferæ gymnospermous.

A'NGLE (*angulus*, a corner). A *plane angle*, according to Euclid, is "the inclination of two lines to one another, which meet together, but are not in the same direction." The point at which they meet is called the *vertex* of the angle; and the angle, there formed, is greater or less, according as the lines forming it diverge more or less from each other.

I. In Mathematics.

1. A *Right Angle* is formed when one straight line meets another straight line perpendicularly, and it contains 90 degrees, or the quarter part of a circle. An *obtuse* angle is that which is greater than a right angle; an *acute* angle, that which is less than a right angle.

2. *Angle, Spherical.* In Trigonometry, the angle formed by the meeting of two lines on the surface of a sphere or globe. Trace any two meridians on the terrestrial globe, as those of London and Petersburg, from the equator northwards; they will meet at the north pole, and there form a spherical angle, which, measured on the equator, will be found equal to 30°.

3. *Angle, Solid.* The angle formed by three or more planes which meet at the same point, as the angles of solid bodies.

4. *Angle, Re-entrant.* An angle whose vertex is turned inwards, and which is consequently greater than two right angles. It is, in fact, a convex angle.

5. *Angle of Contingence*, or *Contact.* The angle made by a curved line and its tangent to it, at the point of contact.

6. *Angle, Rectilinear, Curvilinear, Mixtilinear.* 1. The first is formed by the inclination of two right lines to each other, which meet together, but are not in the same right line. 2. The second is formed by the tangents of two curves, where they meet each other. 3. The third is formed by the meeting of a right line and a curved line.

7. *Angles, Adjacent and Contiguous.* 1. When a side of one angle, being produced, forms a side of another, the two angles are said to be *adjacent*. Hence, adjacent angles are supplements to each other, making together 180°, or two right angles. 2. When two angles have the same vertex, and one side common to both, they are said to be *contiguous*.

8. *Angles, Opposite and Alternate.* 1. When two angles have their sides mutually continuations of each other, they are said to be vertical or *opposite*, and it may be shown that opposite angles are equal, because they have a common *supplement*. 2. The angles which are made on the opposite sides of a line cutting two parallel lines, are called *alternate*.

9. *Angles, Supplemental and Complemental.* 1. When two angles are together equal to two right angles, they are said to be *supplemental*, and one is called the *supplement* of the other. 2. When two angles are together equal to a right angle, they are said to be *complemental*, and one is said to be the *complement* of the other.

II. In Optics.

10. *Angle of Vision.* The angle contained between lines coming from opposite parts of an object and meeting in the eye. On the magnitude of this angle depends the apparent magnitude of all objects perceptible to the sight.

11. *Angle of Incidence.* The angle contained between the line described by the incident ray, and a line perpendicular to the surface on which the ray strikes, raised from the point of incidence.

12. *Angle of Reflection.* The angle contained between the line described by the reflected ray, and a line perpendicular to the reflecting surface, at the point from which the ray is reflected.

13. *Angle of Refraction.* The angle contained between the line described by the refracted ray, and a line perpendicular to the refracting surface at the point in which the ray passes through that surface.

III. In Astronomy.

14. *Angle at the Sun.* The angle under which the distance of a planet from the ecliptic appears at the sun.

15. *Angle of Longitude.* The angle formed by the circle of a star's longitude

with the meridian at the pole of the ecliptic.

16. *Angle, Horary.* The angle formed with the meridian of any place by a great circle, which passes through a star and the pole.

17. *Angle of Commutation.* The angle at the sun, formed by two lines, one drawn from the earth, and the other from the place of the planet reduced to the ecliptic, meeting in the sun's centre.

18. *Angle of Elongation.* The angle formed by two lines drawn from the earth, the one to the sun, and the other to the planet; or it is the difference between the sun's place and the geocentric place of the planet.

19. *Angle of Evection.* An inequality in the motion of the moon, by which, at or near her quadratures, she is not in the line drawn through the centres of the earth and sun, as she is at the syzygies, but makes an angle with that line of about 2° 51′.

IV. In Mechanics.

20. *Angle of Draught.* A term applied to express that direction of a drawing power which is best adapted to overcome friction and weight; and this is found to be the angle made by the line of direction with a line upon the plane over which the body is drawn, and perpendicular to that line of direction.

21. *Angle of Direction and of Elevation.* 1. In mechanics, the angle of *direction* is that comprehended between the lines of direction of two conspiring forces. 2. The angle of *elevation* is that which is comprehended between the line of direction and any plane upon which the projection is made, whether horizontal or oblique.

22. *Angle of Incidence and of Reflection.* When an elastic body strikes an elastic plane at a certain angle, this body returns under the same angle, but in the opposite direction; the former is called the *angle of incidence*, the latter the *angle of reflection.*

V. In Zoology.

23. *Angle, Facial.* An angle composed of two lines, one drawn in the direction of the basis of the skull, from the ear to the roots of the upper incisor teeth, and the other from the latter point to the most projecting part of the forehead.

24. *Angle, Frontal.* In Ornithology, the angle which the culmen, or upper part of the beak, makes with the forehead.

VI. In Fortification.

25. *Angles in Fortification.* These are of two sorts, real and imaginary. 1. *Real angles* are those which actually exist and appear in the works, as the flanked angle, the angle of the epaule, the angle of the flank, and the re-entering angle of the counterscarp. 2. *Imaginary* or *occult angles* are those which are only subservient to the construction, and which exist no longer after the fortification is drawn, as the angle of the centre, the angle of the polygon, the flanking angle, the salient angle of the counterscarp, &c.

ANGUI'NIDÆ (*anguis*, a snake). Slow-worms; a family of Ophidian reptiles, which combine the characters of the serpents and the lizards. They approach the latter in the possession of rudimentary legs under the skin, as well as in other points of their organization. The *slow-worm* of this country, erroneously called *blind worm*, has remarkably brilliant eyes.

A'NGULAR MOTION. The variation in the angle described by a line, or radius, which connects a moving body with the centre about which it moves. Thus, a pendulum has an angular motion about its point of suspension, and the planets have an angular motion about the sun.

Angular Intervals, in Astronomy, measured by means of the transit instrument and clock, are those arcs of the equinoctial, which are intercepted between circles of declination passing through the objects observed.

A'NHYDRITE (α, priv., ὕδωρ, water). Sulphate of lime; a mineral occurring in a crystalline form without water.

A'NHYDROUS (α, priv., ὕδωρ, water). Without water; a term applied to crystals and gases which are deprived of water. See *Hydrate.*

A'NILIC ACID. An acid formed by the action of nitric acid upon indigo, and named from the *anil*, a plant growing in America, from the leaves of which indigo is prepared. The acid was formerly called *indigotic.*

A'NILINE. An oily liquid, which distils over when finely-pulverized indigo is decomposed by a highly concentrated solution of caustic potash or soda, in a retort.

A'NIMA. The name given by Stahl to the intelligent agent supposed to preside over many parts of the animal economy. This is the *archæus* of Van Helmont, and has been termed the vital principle, the spirit of animation, &c. In pure Latin, the word denotes breath, animal life, the air we breathe; and is sometimes synonymous with *animus*, the soul.

ANIMAL KINGDOM. The appellation given to that great division of natural bodies, to which animals belong. These were distributed by Cuvier into four large groups, viz. Vertebrata, Mollusca, Articulata, and Radiata. This arrangement has, however, been modified, and new terms introduced by more recent writers, as will appear in the subjoined table:

I. Sub-kingdom VERTEBRATA.
Myelencephala (Owen).
Spinicerebrata (Grant).

Class 1. Mammalia.
2. Aves.
3. Amphibia.
4. Reptilia.
5. Pisces.

II. Sub-kingdom ARTICULATA.
Homogangliata (Owen).
Diploneura (Grant).
Annulosa (Macleay).

Class 1. Cirrhopoda.
2. Annellida.
3. Myriapoda.
4. Insecta.
5. Arachnida.
6. Crustacea.

III. Sub-kingdom MOLLUSCA.
Heterogangliata (Owen).
Cycloglangiata (Grant).

Class 1. Cephalopoda.
2. Gasteropoda.
3. Brachiopoda.
4. Pteropoda.
5. Conchifera.
6. Tunicata.

IV. Sub-kingdom RADIATA.
Cycloneura (Grant).

Nematoneura (Owen). *Acrita* (Macleay).

Class Radiaria, *Lamarck*.

Echinoderma, *Cuvier*. Acalepha, *Cuvier*.

Class Polypi, *Cuvier*.

Ciliobrachiata, *Farre*. Anthozoa, *Ehrenb*. Nudibrachiata, *Farre*.

Class Entozoa, *Rudolphi*.

Cœlelmintha, *Owen*. Sterelmintha, *Owen*.

Class Infusoria, *Cuvier*.

Rotifera, *Ehrenb*. Polygastria, *Ehrenb*.

ANIMAL MAGNETISM. A supposed agent, of a peculiar nature, discovered by Anton Mesmer, and said to be capable of producing, in some mysterious way, the most powerful effects on the human economy.

ANIMA'LCULES (dim. of *animal*). Microscopic animals existing in rivers and ponds, and in all animal and vegetable infusions. The term was originally applied to a vast number of creatures widely differing from one another in every particular except minuteness of size, but is now restricted to that division of *infusorial* animalcules, termed, from their digestive apparatus, *polygastrica*.

A'NION (ἀνιόν, that which goes up). A term applied by Mr. Faraday to the body which passes to the positive pole, or *anode* of the decomposing body, as it is separated by electricity. See *Kation*.

ANISO'BRYOUS (ἄνισος, unequal, βρύω, to grow). That which grows unequally; a term applied by some writers to monocotyledonous plants, which, having only one cotyledon, grow with unequal force on the two sides of their axis. For the same reason, such plants have been called *anisodynamous*, from δύναμις, force.

ANISOSTE'MONOUS (ἄνισος, unequal, στήμων, a stamen). A term applied to plants in which the number of stamens does not correspond with the number, or any power of the number, of the petals or of the sepals.

ANNEALING. The process of heating a metallic body, and suffering it to cool again in a moderate temperature, in order to restore its malleability, which it is apt to lose under the operation of hammering. If cooled too suddenly, it becomes extremely brittle. The *Annealing of Glass* is conducted in the same manner, and is necessary to prevent its flying to pieces on the application of violence or a high temperature.

ANNE′LLIDA (*annellus*, a little ring). A class of animals which have their bodies formed of a great number of small rings, as the earth-worm. They were distinguished, in Cuvier's arrangement, by their red blood, and by the circulation of their blood in a double system of complicated vessels. MM. Audoin and Milne Edwards adopt four divisions, differing in habits and structure:—

1. *Errantia.* Walking or swimming animals, rarely sedentary. Head distinct from the body; with antennæ, eyes, and generally jaws. These are the *dorsibranchia* of Cuvier, the *nereidæ* of Savigny.

2. *Tubicola.* Sedentary animals, inhabiting the interior of solid tubes. Head not distinct; without eyes, antennæ, or jaws.

3. *Terricola.* Animals furnished with bristles instead of feet; dwelling in the earth. No distinct head, antennæ, or jaws.

4. *Suctoria.* Animals without feet or bristles, but furnished at each extremity of the body with a prehensile cavity or sucker. No distinct head; but generally with eyes and jaws. Chiefly parasitic.

Divisions of Dr. Grant. Dr. Grant divides the Annellida into the following orders, by the differences of their respiratory organs:—

1. *Apneumata*, or those which have no perceptible respiratory organs, as the *nais*.
2. *Cephalobranchia*, or those which present distinct branchiæ at the cephalic extremity of the body, as the *serpula*.
3. *Dorsibranchia*, or those which have external or internal branchiæ disposed along the back of the trunk, as the *nereis*.
4. *Pulmonata*, or those which breathe by pulmonary sacs, as the *lumbricus*.

ANNUAL REVOLUTION. The yearly course of the earth in its orbit round the sun. It must be distinguished from the *diurnal motion*. The latter produces only day and night; the former causes the different lengths of day and night, as well as the phenomena of the seasons.

ANNULAR ECLIPSE (*annulus*, a ring). A term applied in Astronomy to those eclipses of the sun, in which a *ring* of light is visible around the dark body of the moon.

A′NNULATE (*annulus*, a ring). Ringed; surrounded or marked by rings, as certain vessels in plants; also certain animals which appear to be composed of a succession of rings.

ANNULO′SA (*annulus*, a ring). A designation given by Macleay to the division of animals included in the *Articulata* of Cuvier, the *Homogangliata* of Owen, and the *Diploneura* of Grant. Macleay's term relates merely to their annulated skin.

A′NNULUS. A ring. 1. The geometrical term for a solid formed by the revolution of a circle about a straight line exterior to its circumference, as an axis, and in the plane of the said circle. 2. The term *annulus* is applied, in Botany, to that part of the *theca* of ferns, where the stalk is united with its side; and to the *collar* which surrounds the stipes in the highest forms of the fungi.

A′NODE (ἀνὰ, upwards, ὁδὸς, a way). A term applied by Mr. Faraday to that part of the surface of a decomposing body which the electric current *enters*—the part immediately touching the positive pole. See *Kathode.*

ANODO′NTINÆ (α, priv., ὀδοὺς, ὀδόντος, a tooth). A sub-family of the *Unionidæ*, or River Mussels, named from the genus *Anodon*, the shell of which has no articular processes, or *teeth*, at the hinge.

ANODY′NE (ἀνώδυνος, without pain). That which relieves from pain. An agent of this kind which induces sleep, is called a *hypnotic;* if it causes insensibility, it is termed a *narcotic.*

ANO′MALI′STIC YEAR (ἀνώμαλος, irregular). The interval which occurs between two consecutive returns of the earth to the perihelion, or its least distance from the sun. The difference between the *anomalistic* and the *tropical* or common year is owing to the orbit of the earth representing an ellipse, of which the major axis has a slow motion of 11″.8 per annum in advance. In describing this arc, the earth occupies 4′ 39″.7, which, being added to the sidereal period, gives 365d. 6h. 13m. 49s.3 for the anomalistic year. See *Tropical Year.*

ANO′MALY (ἀνώμαλος, irregular). A term applied, in Astronomy, to the angle through which the radius drawn from a planet to the sun has moved with the planet from the time when this was at its least distance from the sun. The *mean anomaly* is proportioned to the time of description: to derive the *true anomaly* from this, is to find the mean angular motion which would have been performed had the motion *in angle* been uniform instead of the motion *in area*, and involves a problem of the transcendental kind.

ANOMOU′RA (ἄνομος, unlawful, *οὐρὰ*, a tail). A family of *Decapods*, distinguished by the very unusual conformation of the tail:—instead of being encased in a hard coat of mail, as in the macroura, the hinder part of the body is soft and coriaceous, possessing only a few detached calcareous pieces, analogous, it is true, to those found in the lobster, but strangely altered in structure. They are known by the name of *soldier-crabs* or *hermit-crabs*.

ANONA′CEÆ. An order of Dicotyledonous plants, named from the typical genus *Anona*, and characterized by a powerful aromatic taste and smell in all their parts. Trees or shrubs, with *leaves* alternate; *petals* 6, hypogynous; *ovaries* numerous; *fruit* consisting of many carpels, distinct or concrete into a fleshy mass.

A′NOPLOTHE′RIUM (ἄνοπλος, unarmed, θηρίον, a wild beast). An extinct fossil quadruped, belonging to the order *Pachydermata*, resembling a pig. The name is derived from the animal having been remarkably deficient in the means of defence, from the form of its teeth, and the absence of claws, hoofs, and horns.

ANO′RMAL (*anormis*, without rule). Irregular; contrary to the usual rule; or, more precisely, destitute of rule. See *Abnormal*.

ANO′RTHITE (ἀν-, the negative prefix, of which α, priv., is a shortened form; ὀρθός, upright). A mineral consisting of silica, alumina, lime, magnesia, and oxide of iron. Its name, which signifies *without right angles*, distinguishes it from felspar, two of whose cleavages are at right angles to each other.

ANOU′RA (α priv., οὐρὰ, a tail). An order of Amphibious animals, comprising the Frogs and Toads, in which the gills and the tail disappear on their reaching the perfect state.

A′NSÆ (*ansa*, a handle). In Astronomy, those parts of Saturn's ring which project beyond the disk of the planet, and appear like *handles* to the body of the planet

ANTA′GONIST POWERS (ἀντὶ, opposite, ἀγωνίζομαι, to struggle). Two powers in nature, of which the action of one antagonizes, or counteracts, that of the other; hence a kind of balance or equilibrium is maintained, and the destructive effects, which would ensue from the unchecked operation of either, prevented. Of this kind are the centrifugal and centripetal forces in Astronomy, the attractive and repulsive agencies in Chemistry, &c.

ANTA′RCTIC (ἀντὶ, ἀρκτικὸς, from ἄρκτος, the bear). That which is opposite to the Arctic.

1. The *Antarctic Pole* is the South Pole, and is opposite to the Arctic or North Pole, which points to the constellations of the Great and the Little Bears.

2. The *Antarctic Circle* is an imaginary circle distant 23° 27′.5 from the Antarctic or South Pole, and 66°.5 from the equator, and parallel to it.

3. The *Antarctic Ocean* is, properly speaking, the ocean between the Antarctic circle and the South Pole.

ANTA′RES. The Scorpion's heart; a star of the first magnitude, marked α, in the constellation Scorpio.

ANTECE′DENT (*antecedo*, to go before). In Logic, that part of a conditional proposition from which the other part, or the *consequent*, results; the connexion between the two, expressed by the word "if," is called the *consequence*. In the proposition, "If logic is useless, it deserves to be neglected," both antecedent and consequent are *false;* yet the whole proposition is *true*—the consequent *follows* from the antecedent.

The term *Antecedent*, in Mathematics, denotes the *former* of the two terms of a ratio, as distinguished from the *latter* term, or *consequent*. Thus, in the continued proportion,

2 ∶ 4 ∷ 3 ∶ 6 ∷ 4 ∶ 8 ∷ 5 ∶ 10, &c.

2, 3, 4, 5, &c., are antecedents, and 4, 6, 8, 10, &c., are consequents. Antecedents and consequents may be inverted, without destroying the proportion. Thus, if

2 ∶ 4 ∷ 5 ∶ 10,

it is equally true that

4 ∶ 2 ∷ 10 ∶ 5.

ANTECEDE′NTIA. An astronomical term, denoting that a celestial body moves contrary to the order of the signs of the Zodiac; it is then said to move *in antecedentiâ*. When it moves in the order of the signs, it is said to move *in consequentiâ*.

ANTELO′PIDÆ. The Antelope tribe; a family of the *Ruminantia*, remarkable for the activity of their movements, and for the solidity of the *core*, or bony support of their horns. The name antelope is a corruption of *antholops*, and this is derived from ἄνθος, a flower, and ὤψ, the eye,—in allusion to the beautiful eyes of the gazelle, or "antholops" of Eustathius.

ANTE'NNÆ (*antenna*, a yard-arm). The articulated horns, or jointed feelers, with which the heads of insects and crustaceans are invariably furnished. In the latter class they are usually four in number, consisting each of a *scape*, a *pedicel* of two joints, and a *clavolet*, which is divided into many minute joints. The term antennæ is sometimes applied to the analogous parts, which are not jointed, in worms and other animals.

ANTE'RIOR. Before. This term, applied to bivalve shells, denotes that valve in which the ligament is not placed.

ANTHE'LION (ἀντὶ, opposite, ἥλιος, the sun). A bright spot, opposite to the sun. The horizontal circle attendant upon halos is usually accompanied by *parhelia*, and occasionally by *anthelia*.

A'NTHER (ἀνθηρὸς, from ἀνθέω, to flourish). The part of a plant which has hitherto been considered as the fertilizing organ. It is the essential part of the stamen, consisting, in most cases, of two thecæ placed at the top of the filament, and hence called the *bilocular anther*. The anther is termed,

1. *Innate*, when it is attached to the filament by its base, as in sparganium.

2. *Adnate*, when it is attached to the filament by its back, as in polygonum.

3. *Versatile*, when it is attached to the filament by a single point of the connective, from which it lightly swings, as in grasses.

4. *Antica* or *introrsa*, when the line of its dehiscence is towards the pistil.

5. *Postica* or *extrorsa*, when the line of its dehiscence is towards the petals.

ANTHERI'DIA. Little anthers; a designation of the jointed filaments which occur in mosses, containing vibrios lodged in mucous cells, and surround the rudiment of the future theca. They are also called *staminidia*, or little stamens, though they appear to have no analogy to the stamens of flowering plants.

A'NTHIARIN. A gum resin, obtained from the *Anthiaris toxicaria*, the most deadly of the Upas poisons, employed by the inhabitants of the East Indian Archipelago to poison their arrows.

ANTHOCA'RPOUS (ἄνθος, a flower, κάρπος, fruit). A term applied, in Botany, to multiple fruits formed by masses of inflorescence in a state of adhesion, as the pine-apple, the fir-cone, &c.

ANTHO'DIUM (ἀνθώδης, flowery, full of flowers). A term sometimes applied by botanists to the inflorescence of the Compositæ, which is more commonly called a *capitulum*. In either case it is merely a depressed spike.

ANTHO'PHORUM (ἄνθος, a flower, φέρω, to bear). A term applied by De Candolle to an elongated internode which occurs below the receptacle in the Caryophyllaceæ, and bears on its summit the petals and stamens.

ANTHOPHY'LLITE (ἄνθος, a flower, φύλλον, a leaf). A massive mineral, of a brownish colour, found at Konigsberg in Norway. Its appearance suggests that of the *anthophyllus*, or clove, which derives its name from the fragrance of its flowers and the beauty of its leaves.

ANTHOZO'A (ἄνθος, a flower, ζῶον, an animal). A term applied by Ehrenberg to a class of polyps, including the actinia and allied species, commonly called *animal-flowers*.

A'NTHRACITE (ἄνθραξ, a burning coal). A species of slaty coal found in the transition-rock formation, and often called *stone coal*, *glance coal*, and *blind coal*. It differs from common coal, which it frequently accompanies, in containing no bituminous substances, and in not yielding inflammable gases by distillation. It consists, in some specimens, of 95 per cent. of carbon. Its varieties are the massive or conchoidal, the slaty, and the columnar.

A'NTHRACOTHE'RIUM (ἄνθραξ, a coal, θηρίον, a wild beast). The name of an extinct quadruped, supposed to belong to the Pachydermata, the bones of which were first found in lignite and coal of the tertiary strata.

ANTHRANI'LIC ACID. An acid obtained by the action of fused potash on indigo.

ANTHROPO'GRAPHY (ἄνθρωπος, man, γράφω, to describe). A description of mankind, with reference to their geographical distribution, the physical character and language of their classes, their distinction into nations and tribes, and their religious and domestic habits. See *Ethnography*.

ANTHROPO'LOGY (ἄνθρωπος, man, λόγος, an account). The science or theory of man, with reference to the physiological and the mental phenomena of his nature. The term is sometimes restricted to the science of Anatomy.

ANTILO'GARITHM. A term denoting the *number to the logarithm:* thus, 100 is the antilogarithm of 2, because 2 is the logarithm of 100. Among the French, the term is more generally employed in the sense of the *complement* of the logarithm, viz. the remainder produced by subtracting the logarithm from the next higher term in the series 1, 10, 100, &c.

A'NTIMONY. A brittle whitish metal, usually found associated with sulphur. Sometimes this sulphuret is termed *crude* antimony, to distinguish it from the pure metal, formerly called *regulus* of antimony. Its name has been fancifully derived from its fatal effects upon some monks (*anti-moine*), upon whom Valentine is said to have tested its properties.

Argentine flowers of Antimony is a name for the sesqui-oxide of the metal, derived from its silvery whiteness. In the *powder of Algaroth*, the physician Algarotti has given his name to the oxychloride. The *glass*, *liver*, and *crocus* of antimony are oxy-sulphurets of the old apothecaries; the *saffron* is a substance formed by dissolving the oxide of the metal out of the *glass*, by means of acids. The *kermes mineral* is a sulphuret, resembling in colour the insect kermes; the *golden sulphuret* is a similar substance. The *butter* of antimony is the sesqui-chloride, a soft solid, of the consistence of butter.

A'NTIPERISTA'LTIC (ἀντὶ, opposite, περισταλτικός, clasping and compressing). A term denoting that the vermicular contractions of a muscular tube follow one another in a direction the reverse of the ordinary one.

ANTI'PODES (ἀντὶ, opposite, πόδες, feet). The inhabitants of our globe who live diametrically opposite to each other, and who may therefore be said literally to stand feet to feet. All gravitate to the centre of the earth; and the terms *up* and *down* must be considered, in astronomical language, merely in relation to bodies being further from or nearer to the centre. The antipodes differ in longitude 180°, and the one class of inhabitants has the same latitude north as the other has south.

ANTI'SCII (ἀντὶ, opposite, σκιά, a shadow). Those inhabitants of the earth, whose shadows fall in opposite directions. The inhabitants of the north and south temperate zones are always antiscians; those residing within the tropics, are antiscians during only one season of the year. See *Ascii.*

ANTISE'PTIC (ἀντὶ, against, σήπω, to putrefy). A term applied to substances which prevent putreafction in animal or vegetable matter, as common salt.

ANTI'THESIS (ἀντίθεσις, opposition). In Rhetoric, this term denotes contrast of ideas, whether expressed by single words or by single clauses. Quinctilian renders it by the Latin term *contrapositum*, and the following is an illustration from Cicero:—"quod scis, nihil prodest; quod nescis, multum obest."

ANTI'TROPOUS (ἀντὶ, against, τρέπω, to turn). Straight, and having a direction contrary to that of the body to which it belongs; a term applied in Botany to the direction of the embryo compared with that of the seed: thus, if the nucleus be erect, the embryo may be inverted, and it is then said to be *antitropous*, as in the nettle. The radicle of the embryo is then turned to the point most remote from the hilum.

A'NTLIA. The Latin term for a pump, and hence applied to the spiral instrument of the mouth of butterflies and allied insects, by which they pump up the juices of plants.

A'NTLIA PNEUMA'TICA. The Air-pump; the name of a constellation in the southern hemisphere.

ANTŒ'CI (ἀντὶ, opposite, οἶκος, a habitation). Those who live under the same meridian, and at the same distance from the equator, but the one party having north, and the other south latitude. See *Ascii.*

A'NTONOMA'SIA (ἀντὶ, instead of, ὄνομα, a name). A rhetorical figure, by which a proper name is used for a characteristic appellation, as when a benefactor is called "a Howard," a despot "a Turk;" or *vice versâ*, as when a queen is called "Her Majesty," or Homer "the prince of poets."

A'ORIST (ἀόριστος, indeterminate). A term applied, in Grammar, to those inflexions of the verb in which the *time* of the action is *undefined.*

A'PATITE (ἀπατάω, to deceive). Phosphate of lime; a mineral which occurs in tin veins, and possesses phosphorescent properties. It is named from its having been confounded with other minerals.

A'PERTURE (*apertura*, a little opening). The mouth of univalve shells, or the cavity from which the head of the animal is protruded.

APE'TALOUS (α, priv., πέταλον, a petal). A term applied to plants which have a calyx, but no corolla or petals. They are also called *monochlamydeous,* as having a single envelope, viz. a calyx.

A'PEX. The pointed top of a cone. The point or nucleus of a shell; and hence the term is applied to the bosses of bivalves, the points or tops of limpets, or of univalves. In Botany, the apex of a seed is the extremity opposite to the base; the apex of a fruit is the part where the remains of the style are found.

APHÆ'RESIS (ἀπὸ, from, αἱρέω, to take). Literally, *a taking away;* a grammatical figure by which words are shorn of their fair proportions, as when we say *'tis* for "it is;" *'tisn't* for "it is not."

APHANI'PTERA (ἀφανὴς, obscure, πτερὸν, a wing). The Flea tribe; an order of insects which have only the rudiments of wings, in the form of little scales, attached to the second and third segments of the body, in which there is no proper distinction of thorax and abdomen. They undergo metamorphosis.

A'PHANITE (ἀφανὴς, indiscernible). A greenstone rock containing amphibole as its principal ingredient, and named from the *indiscernible* distinction of its parts. It is the *lapis corneus trapezius* of the old mineralogists.

APHE'LION (ἀπὸ, from, ἥλιος, the sun). An astronomical term, denoting the greatest distance of a planet from the sun. Its opposite point is the *perihelion,* which is the nearest point to the sun. These two points are, therefore, the two extremities of the greater axis of an orbit.

A'PHIDÆ (*aphis,* the plant-louse). The Plant Lice; a family of the dimerous *Homoptera,* which infest plants, and are vulgarly supposed to give rise to the phenomena of blights and honey-dew.

APHLOGI'STIC (ἀφλόγιστος, not inflammable). Without flame; a term applied to a lamp in which the combustion is effected without flame.

A'PHRITE (ἀφρός, foam). Earth foam; a silvery-white, friable carbonate of lime, found in calcareous veins.

A'PHRIZITE. A variety of black tourmaline.

APHY'LLOUS (α, priv., φύλλον, a leaf). Leafless; a term applied to plants which have large scales, but no true leaves; also to plants in which the true leaves are so small as to be reduced to scales.

APIA'CEÆ (*apium,* parsley). A term recently applied to the family of Umbelliferous plants, as more consonant with the plan of forming natural orders. See *Umbelliferæ.*

A'PICAL (*apex,* the top of a cone). Belonging to the pointed end of a cone-shaped body.

APIO'CRINITE (ἄπιον, a pear, κρίνον, a lily). Pear-encrinite; a sub-genus of fossil encrinites, in which the stem is rounded and dilated at its upper extremity into a pear-shaped figure.

APIS MUSCA. A modern southern constellation, consisting of four stars.

APLANA'TIC (α, priv., πλάνη, error). Free from error; a term applied to those optical instruments in which the spherical and the chromatic aberrations are completely corrected. This term is more correct than *achromatic,* which merely implies correction of the chromatic aberration; whereas a good, or aplanatic, instrument has its errors of sphericity balanced equally with those of colour.

APLO'ME (ἁπλόος, simple). A mineral usually considered as a variety of the garnet, from which, however, it appears to differ in its primitive form. It crystallizes in rhombic dodecahedrons, derived by the simplest laws of decrement from the cube.

APOCA'RPOUS (ἀπὸ, from, κάρπος, fruit). A term applied, in Botany, to that condition of the carpels, in which they are distinct from one another, or easily separable, as in ranunculaceous plants. See *Syncarpous.*

APOCY'NACEÆ. An order of Dicotyledonous plants, named from the typical genus *Apocynum,* and agreeing with Asclepiadaceæ, but of rather more suspicious properties. Trees or shrubs usually milky, with *leaves* opposite, sometimes whorled; *corolla* monopetalous, hypogynous; *stamens* inserted into the corolla; *ovaries* two; *fruit* a follicle, capsule, drupe, or berry, single or double.

A'PODA (α, priv., ποὺς, ποδὸς, a foot). An order of Amphibious animals, comprising only one genus, the *Cæcilia,* of a serpent-like form, and altogether destitute of feet. The term is also applied to an order of fishes which have no ventral fins. See *Malacopterygii.*

APO'DOSIS (ἀπόδοσις, a giving back). A term employed in Rhetoric to denote the consequent proposition, as opposed to *protasis*, which is the hypothetical or limiting clause of a period.

A'POGEE (ἀπὸ, from, γῆ, the earth). That point of the moon's orbit in which she is furthest from the earth. Her *perigee* is that in which she is nearest to the earth. Formerly, when the earth was considered as the centre of the system, the terms *apogee* and *perigee* were applicable to the places of all the planets, and also of the sun, with respect to their variable distances from the earth; but now they refer only to the moon. What was then called the sun's *apogee* is now the earth's *aphelion;* and the *perigee* of the former has become the *perihelion* of the latter.

APOPHY'LLITE (ἀποφυλλίζω, to strip off leaves). *Ichthyophthalmite*, or *fish-eye stone.* A scarce mineral, having a pearly lustre, like the species of felspar called moonstone. It is found in the iron mines of Uto, in Sudermania, a province of Sweden. The term is derived from the lamellar structure of the mineral, and its *exfoliation* under the blowpipe.

APO'PHYSIS (ἀπὸ, from, φύω, to grow). A process of a bone, and a part of the same bone. An unequal expansion sometimes found at the base of the theca in mosses.

A'POSIOPE'SIS (ἀποσιωπάω, to be silent after speaking). Literally, the *becoming silent;* a rhetorical figure, by which, for emphasis or modesty, the sentence is broken off, as in Virgil, *Æn.* I. 135. The aposiopesis is expressed, in writing, by a short horizontal line at the point where the sense is broken off.

APOSTASIA'CEÆ. An order of Dicotyledonous plants, named from the genus *Apostasia*, and closely allied to the Orchidaceæ, from which they differ essentially in having a 3-celled fruit, with loculicidal dehiscence, and in the style being altogether free from the stamens for the principal part of its length.

APOTHE'CIA (ἀπὸ, from, θήκη, a capsule). Scutella, or little *shields;* a term applied, in Botany, to the reproductive organs of lichens.

APPA'RENT (*appareo*, to appear). A term applied in Astronomy to those phenomena which are actually observed, as distinguished from *real* or *true* phenomena, which result from correction or reduction. Thus, the apparent altitude of a star requires a correction for refraction; the apparent place of a planet requires a reduction to that place in which it would be seen from the centre of the earth.

1. *Apparent diameter of a planet.* The angle made by two lines drawn to the eye from the opposite points of the planet's disk. The *true* diameter is the line which joins the opposite points of the disk itself.

2. *Apparent horizon.* The sensible horizon, or the plane in which lies the circle which actually bounds our view. The *real* or *rational* horizon is a plane parallel to the preceding, drawn through the centre of the earth.

3. *Apparent magnitude.* The angle under which any line appears at the eye; that is, the angle made by lines drawn from its extremities to the eye.

4. *Apparent motion.* The velocity and direction in which a body appears to move, when the spectator is himself unconsciously in motion.

APPENDI'CULATE (*appendicula*, a little appendage). That which has small appendages, as applied in botany to the calyx of scutellaria.

APPE'NDIX (*appendo*, to hang to). An appendage; a process appended to any part of a body, without being essential to the existence of the body, as a thorn or gland in plants.

A'PPETENCY (*appeto*, to seek). The disposition of organized beings to acquire and appropriate substances adapted to their support.

APPOSI'TION (*appono*, to place near). That part of the function of nutrition, by which the constituents of the blood are transformed on the free surface of an organ into a solid unorganized substance, which is the mode of growth of the non-vascular tissues. See *Transformations.*

APPREHE'NSION, SIMPLE. In logic, that act or condition of the mind, in which it receives a notion of any object. It is analogous to the perception of the senses. *Incomplex apprehension* regards one object, or several without any *relation* being perceived between them, as a man, a card, &c *Complex apprehension* regards several objects *with* such a relation, as a man on horseback, a pack of cards, &c.

APPROXIMA'TION (*ad*, to, *proximus*, nearest). A result in experimental philosophy, which approaches more or less near to the truth, as the calculation of the distance, or of the diameter, of a celestial body. In mathematics, quantities are said to be *approximate*, which are nearly, but not absolutely, equal.

[illegible] Perfect fall from centre of

[illegible]

APPU'LSE (*appello*, to drive to). The near approach of two celestial bodies to each other in angular distance, so as to be seen, for instance, within the field of a telescope.

A PRIO'RI. A POSTERIO'RI. Terms expressive of two different modes of reasoning. By the argument *à priori*, a conclusion is drawn from an antecedent fact, whether the consequence be in the order of time, or in the necessary relation of cause and effect. By the argument *à posteriori*, we reason from what is consequent in the order of time to what is antecedent, or from effect to cause. An individual may fall under suspicion of murder for two reasons: he may have coveted the deceased's property, or he may be found with it in his possession; the former is an *à priori*, the latter an *à posteriori* argument against him.

A'PSIDES (*ἀψὶς*, a curved link of a chain). *Apses.* Those points in a planet's orbit, in which it is at its greatest or least distance from the sun or earth. The line joining them, and passing through the sun's or the earth's centre, is called the *line of the apsides*. This term occasionally coincides with other terms. Thus, in the orbit of the earth, or of any primary planet, its *higher apsis* is also its *aphelion*, its *lower apsis* its *perihelion;* in the moon's orbit, the *higher apsis* is equivalent to the *apogee*, the *lower apsis* to the *perigee*.

A'PTERA (α, priv., πτερὸν, a wing). A series of insects characterized by the absence of wings. Some of these do not undergo metamorphosis; these compose the orders *thysanoura* and *parasita*, while those which undergo this change, form the order *syphonaptera*.

A'PUS (ἄπους, without feet). *Avis Indica.* Bird of Paradise; a constellation in the southern hemisphere, consisting of eleven stars. The bird of Paradise was formerly supposed to have no feet.

A'PYROUS (α, priv., πῦρ, fire). A term applied to bodies which sustain the action of a strong heat for a long time without change of figure or other properties. It is synonymous with *refractory*.

AQUA FORTIS. An impure nitric acid, distinguished by the terms *double* and *single*, the latter having only half the strength of the former. The more concentrated acid, which is much stronger than the double aqua fortis, is called by artists *spirit of nitre*.

AQUA MARINE. A designation of *beryl*, a mineral of a green colour of various shades, also called greenish-yellow emerald.

AQUA REGIA. Royal water; an alchemical designation of *nitro-muriatic* acid, from its property of dissolving gold, the king of metals.

AQUA'RIUS. The eleventh of the zodiacal constellations, consisting of 108 stars, the principal of which is Scheat. It presided over the second month of summer, and extended from the 20th of July to the 20th of August. The inundation of the Nile increases during this month.

A'QUEOUS (*aqua*, water). A term synonymous with *hydrate*, and employed for expressing definite combinations with water. It admits of prefixes, as *bin*-aqueous, when two atoms of water enter into a compound.

A'QUEOUS ROCKS. A term applied in geology to rocks of the second and third classes, as composed of matter deposited by water. Those of the second class are more especially named *metamorphic*, from the supposition of their having undergone a remarkable change in the course of their formation. Aqueous rocks are likewise called *stratified*, as being invariably found in strata or layers.

AQUIFOLIA'CEÆ. The Holly tribe of Dicotyledonous plants, named from the typical genus *aquifolium*. Trees or shrubs, with *leaves* alternate or opposite, coriaceous; *corolla* 4 or 5-parted, hypogynous; *ovary* fleshy, superior, 2-4-celled; *fruit* fleshy, indehiscent, with 2 to 6 stones.

A'QUILA. The Eagle; a northern constellation, containing (with Antinous) seventy-one stars, the principal of which is Altan.

AQUILARIA'CEÆ. The Agallochum tribe of Dicotyledonous plants, named from the typical genus *aquilaria*. Trees with *leaves* alternate; *calyx* turbinate or tubular; *stamens* 10 or 5; *ovary* superior; *capsule* pear-shaped, 1-celled, 2-valved.

AQUITE'LÆ (*aqua*, water, *tela*, a web). A family of spiders, which spread their silken filaments under water, to entrap aquatic insects.

A'RA. The Altar; a southern constellation, containing nine stars.

ARA'CEÆ. *Aroideæ*. The Arum tribe of Monocotyledonous plants. Herbaceous plants with *leaves* sheathing at the base; *flowers* unisexual, arranged upon a spadix, within a spathe; *stamens* hypogynous; *ovary* superior; fruit succulent.

ARACHNI'DA (ἀράχνη, a spider). A class of the *Articulata*, or the Diplogangliata of Grant, comprising articulated animals, generally with four pairs of legs, without wings or metamorphosis, as the spiders, mites, and scorpions. They are divided, by the difference of their respiratory organs, into

1. *Tracheata*, which breathe by ramified tracheæ, as the phalangium, in which there are only two abdominal stigmata; and

2. *Pulmonata*, which breathe by pulmonary sacs opening by 2-8 transverse abdominal stigmata, as in the scorpions and spiders.

ARÆO'METER (ἀραιὸς, thin, μέτρον, measure). An instrument, also called a *hydrometer* or *gravimeter*, for ascertaining the specific gravities of bodies, by the depth to which it sinks in these bodies, the amount being shown either by weights, or by a scale attached to it. Hence they are distinguished as *weight* and *scale aræometers*, the former being used chiefly for finding the specific gravity of solids and fluids, whilst the latter serve only for finding that of fluids, after which, indeed, they are frequently named.

Per Cent. Aræometer. An aræometer made for particular and mixed liquors, in which the scale is so graduated as to express the component parts per cent., either by weight or volume. It is named after the fluid it is used to test, as spirit of wine aræometer, beer aræometer. To this class belongs the *powder aræometer*, for ascertaining the proportion per cent. of saltpetre in gunpowder.

ARALIA'CEÆ. The Aralia tribe of Dicotyledonous plants. Trees, shrubs, or herbs, with, in all respects, the habit of Umbelliferæ, from which they are distinguished chiefly by their many-celled fruit and more shrubby habit.

ARANEI'DÆ (*aranea*, a spider). A section of the *Arachnida*, including the Spiders, which are distinguished by having the abdomen furnished with *spinnerets*, by means of which these animals manufacture silken filaments for the construction of their *web*.

ARA'NEIFO'RMES (*aranea*, a spider, *forma*, likeness). An order of edentulous crustaceous animals, in which the extremities are rod-like, long, and adapted for walking.

ARA'NGOES. A species of beads made of rough carnelian, formerly imported from Bombay, for re-exportation to Africa.

A'RBOR. A term fancifully applied to certain *arborescent* forms assumed by *metals* under particular circumstances: thus *arbor Dianæ* signifies silver, when precipitated from its oxide in the metallic form by mercury; *arbor Saturni* denotes lead, when separated from its salts in a metallic state by zinc.

ARBORE'SCENT (*arbor*, a tree). Having the characters of a *tree*, as distinguished from those of a shrub or herb.

ARC (*arcus*, a bow). A portion of a curved line or circle. Thus the latitude and declination are arcs of the meridian, and the longitude is the arc of the equator or parallel circle.

1. *Arc of direction*. The arc which a planet appears to describe, when its motion is direct or progressive.

2. *Arc of retrogradation*. The arc which a planet describes whilst moving contrary to the order of the signs, or from east to west.

A'RCADÆ. Arch-shells; a family of the atrachian bivalves, named from the typical genus *arca*, in which the shell is of various shapes, but the valves close all round.

ARCA'NUM. A secret; a secret remedy, as *arcanum duplicatum*, an old name for sulphate of potash; *arcanum tartari*, deutoxide of mercury, &c. The philosophers' stone was named by the alchemists *arca arcanorum*, a chest of secrets.

ARCHÆ'US (ἀρχὴ, beginning). A hypothetical intelligent agent, adopted by Van Helmont, resembling the *anima* of Stahl. See *Anima*.

A'RCHIL. A violet red paste, prepared from the lichen *Parmelia*, or *Roccella*, and used in dyeing. The plant, reduced to a pulp, and treated with impure ammoniacal liquor, yields a rich purple tincture, called *litmus*, or *turnsole*, used in chemistry as a test.

ARCHIME'DES' SCREW. An apparatus employed by Archimedes for raising water and draining land in Egypt. It consists of a large tube, coiled round a shaft of wood, to keep it in place and give it support. Both ends of the tube are open, the lower one being dipped into the water to be raised, and the upper one discharging it in an intermitting stream. The shaft turns on a support at each end, the upper support being elevated in the air, the lower being hidden beneath the water.

ARCHIPE'LAGO. A general term

applied to a cluster of islands, especially to those lying between the shores of Greece and Asia Minor. The term is perhaps derived from Αἴγειον πέλαγος, *Ægæum pelagus*, the Ægean sea.

A'RCTIC CIRCLE (ἄρκτος, a bear). An imaginary line extending round the North Pole, 66½ degrees from the equator, and parallel to it. This, and the Antarctic circle, are called the *polar circles*.

A'RCTIC CURRENT. A current in the North Atlantic, which seems to originate in the extensive masses of ice surrounding the North Pole, runs down along the eastern shores of Greenland, doubles the Cape, and runs up the western coast of Greenland, crosses Davis's Strait, follows the coast of Labrador, runs to the east of Newfoundland, and eventually joins the gulf stream between 43° and 47° of longitude.

A'RCTIC POLE (ἄρκτος, a bear). A designation of the North Pole of the earth, from its pointing to the constellations of the Great and Little Bears.

ARCTU'RUS or α BOO'TES (ἄρκτος, the bear, οὐρὰ, the tail). A star of the first magnitude in the northern constellation Bootes. It is nearly in a right line drawn through the two hinder stars in the tail of the Bear.

A'RCUATE (*arcus*, a bow). Curved or arched; a term applied, in Botany, to any thing bent like the arc of a circle, as the legume of medicago falcata, the embryo of certain plants, &c.

A'RDEIDÆ (*ardea*, the heron). The Heron tribe; a family of the *Grallatores*, or wading birds, including the herons, cranes, and storks, in which the beak is long, thick, and stout, usually with cutting edges as well as a point.

A'REA. The Roman *area* was a threshing-floor; but the term is employed by geometricians to denote any superficies or surface of a determinate extent, and is applied exclusively to plane figures.

A'REOLATE (*areola*, a little space). Divided into areolæ or small spaces, as applied to surfaces.

ARFWE'DSONITE. A ferruginous variety of hornblende, named from Arfwedson.

A'RGAL. *Wine-stone.* Crude tartar; an acidulous concrete salt, deposited on the interior of wine-casks, and used by dyers as a mordant. On being purified, it is called *cream* or *crystals of tartar*.

ARGAND LAMP. A lamp with a hollow wick, for furnishing a rapid supply of air to the interior as well as to the exterior of the flame. It is named from its inventor, who was a native of France.

ARGILLA'CEOUS EARTH. *Argilla.* White clay, or potters' earth; the earth or clay, called by chemists *alumina*, from its being obtained in its greatest purity from alum.

ARGILLA'CEOUS ROCKS (*argilla*, clay). Homogeneous soft substances, composed chiefly of aluminous earth, or clay. They comprise the shale or slate-clay, bituminous shale, clay, and marl.

ARGI'LLITE (*argilla*, clay). Argillaceous schist, or clayslate; a mineral abundantly distributed in both primitive and transition mountains.

ARGO NAVIS. The Ship; a southern constellation, containing sixty-four stars, the principal of which is Canopus.

A'RGUMENT. In Logic, an expression in which, "from something laid down and granted as true (*the premises*), something else (*the conclusion*) beyond this must be admitted to be true, as following necessarily from the other."

I. The term *Argument*, in ordinary discourse, has several meanings. 1. It is very often used for the premises alone, in contradistinction to the conclusion; *e. g.*, "the conclusion which this argument is intended to establish is so and so." 2. It is sometimes employed to denote what is, strictly speaking, a *course* or *series* of such arguments, as when it is applied to an entire dissertation. 3. Sometimes it signifies a *disputation*, or *two* trains of argument, opposed to each other. 4. Lastly, the *various forms of stating* an argument are sometimes spoken of as *different kinds* of argument, as if the same argument were not capable of being stated in various ways.—*Whately.*

II. The term *Argument*, in astronomical tables, denotes the angle or quantity on which a series of numbers depends. If, for instance, a table were formed of the sun's declination, corresponding to every degree, &c., of longitude, so that, the longitude being known, the declination might be found opposite to it in the table, the longitude would then be called the *argument* of the declination, and the table would be said to be *entered* with the argument.

ARGUME'NTUM AD HOMINEM. A form of argument, described by logicians, in which the conclusion actually established is not the absolute and general one in question, but relative and particular; viz., not that "such and such is the fact," but that "*this man* is bound to admit it, in conformity to his principles of reasoning, or in consistency with his own conduct, situation," &c.

1. The *argumentum ad hominem*, in the popular but less scientific sense, "is addressed to the peculiar circumstances, character, avowed opinions, or past conduct of the individual, and therefore has a reference to him only, and does not bear directly and absolutely on the real question, as the *argumentum ad rem* does.

2. "The *argumentum ad verecundiam*, in like manner, is described as an appeal to our reverence to some respected authority, some venerable institution, &c.; and the *argumentum ad populum*, as an appeal to the prejudices, passions, &c., of the multitude.

3. "The *argumentum ad ignorantiam* is usually enumerated with these, but is evidently nothing more than the employment of *some* kind of fallacy, in the widest sense of that word, towards such as are likely to be deceived by it."

A'RIES. A zodiacal constellation of fixed stars, drawn on the globe in the figure of a *ram*. It is the first of the twelve signs of the zodiac, from which a twelfth part of the ecliptic takes its name. It indicates the first month of autumn, extending from the 20th of September to the 20th of October. It consists of 66 stars.

A'RIETIS. A star of the second magnitude, in the head of the Ram.

ARI'LLUS. A term applied, in Botany, to an expansion of the placenta, or funiculus, about the seed: the *mace* of the nutmeg, and the red covering of the seed of the spindle-tree, are instances.

ARI'STOLOCHIA'CEÆ (ἄριστος, the best, λοχεία, delivery). The Birthwort tribe of Dicotyledonous plants, so named from the reputed emmenagogue properties of the genus Aristolochia. Herbaceous plants or shrubs, with *leaves* alternate; *flowers* apetalous, hermaphrodite; *stamens* epigynous; *ovary* many-celled; *fruit* dry or succulent, many-celled.

ARI'THMETIC (ἄριθμος, number). The science which treats of *numbers*, of the mode of expressing them, of the manner of computing by them, and of the various uses to which they are applied in the practical business of life.

1. *Arithmetical Complement.* That which a number wants of the next highest decimal denomination. Thus, what 7 wants of 10, *viz.* 3; what 32 wants of 100, *viz.* 68; what 159 wants of 1000, *viz.* 841; or .017 of 1, *viz.* .983; are the arithmetical complements of these numbers.

2. *Arithmetical Mean.* That number or fraction which is intermediate between two other numbers, as 10 between 6 and 14; 10½ between 4 and 17. To find the arithmetical mean, take the *half sum* of the two numbers.

A'RMATURE (*armatura*, armour). A term, in its general sense, denoting *armour*. A natural magnet is, however, said to have an armature, or to be *armed*, when its two poles are polished and covered over with smooth plates of iron, which terminate in two strong projecting ends. The magnetic power, imparted by this means to the two iron plates, is concentrated in the knobs, and thus a north and a south pole are made.

A'RMILLARY SPHERE (*armilla*, a bracelet). A hollow sphere, representing the several circles of the globe: it is so constructed that all the surface of the sphere is cut away, except the equator, ecliptic, colures, &c. See *Astrolabe.*

A'RQUIFOUX. A lead ore, commonly called *potters' ore*, from its being used by potters as a green varnish.

A'RRAGONITE. An impure species of carbonate of lime, found in Arragon in Spain. It occurs in the form of fibrous branches, which ramify from a centre, called *flos ferri*, or iron-flower.

ARROW-HEADED CHARACTERS. A term applied to certain marks stamped on the bricks of Babylon, and cut on the marble monuments at Persepolis. Their character is formed from the isosceles triangle or wedge, and hence they are termed in Latin *cuneiformes*, or wedge-shaped.

A'RSENIC (ἀρσενικὸν, masculine; an old epithet, denoting powerful properties). A bluish-white metal, of great brilliancy, resembling steel. The arsenic of commerce, commonly called *white arsenic*, and known as a violent poison, is arsenious acid. The *fuming liquor of arsenic* is the sesquichloride, a colourless volatile fluid, which fumes strongly on exposure to the air. *Realgar*, also called ruby, or red arsenic, is the protosulphuret. *Orpiment*, or yellow arsenic, is the sesquisulphuret, and constitutes the colouring principle of the pigment called *king's yellow*. Another well-known pigment, called *Scheele's mineral green*, consists of an arsenite of copper. On exposing the metal to a moist atmosphere, a black powder is obtained, called *poudre a mouches*, or *fly-powder*. Lastly, a solution of arsenic in muriatic acid, heated and condensed, sublimes into a thick liquid, formerly called *butter of arsenic.*

ARSE'NICAL MINERALS. A class of minerals in which arsenic acts the part of the *electro-negative* element. They occur in primitive districts, and are usually associated with metallic sulphurets.

A'RSENOVI'NIC ACID. An acid produced by the action of arsenic upon alcohol.

A'RSIS and THE'SIS (ἄρσις, elevation; θέσις, depression). Technical terms employed in ancient music and ancient metrics. *Arsis* denoted an elevation of the voice, which is now called metrical accentuation. *Thesis* was a depression of the voice, and was opposed to arsis. In Music, the terms signified the rising and the falling of the hand in beating time; and hence the Latin word *ictus*, or stroke, corresponded with arsis. Lastly, *per arsin* expressed, in Music, a fall from acute to grave; *per thesin*, a rise from grave to acute.

ART and SCIENCE. *Art* is the application of knowledge to practical purposes. *Science* is a knowledge of the principles of art. If the knowledge be merely accumulated experience, its application is *empirical art;* but if it be experience reasoned upon and brought under general principles, it assumes a higher character, and becomes a *scientific art.*

ARTE'RIALIZA'TION. The conversion of the *venous* into the *arterial* blood, during its passage through the lungs, by the extrication of carbonic acid, and the absorption of oxygen from the air.

ARTE'SIAN WELL. A perpendicular perforation of the crust of the earth, of small diameter and of great depth, through which water rises to the surface by an artificial jet. The term is derived from *Artesium,* or Artois, where considerable attention has been paid to this means of procuring water.

ARTHRO'DIAL (ἄρθρον, a joint). Belonging to a joint, but restricted to that form of joint in which a ball is received into a shallow cup, commonly called the ball-and-socket joint.

A'RTICLE (*articulus*, a joint). The name given by grammarians to two words, *a* or *an*, and *the*, which are prefixed to substantives for the purpose of showing whether they are used in a general sense or in particular relation to an individual. *An* is a corruption of *one*, and *a* is a greater corruption of the same adjective. *The* appears to be derived from the Greek το, through the Gothic *sa* or *tha*, and thence through the German *der* or the Dutch *de*.

A'RTICULA'TA (*articulus*, a joint). Articulated or jointed animals; one of Cuvier's four great divisions of the Animal Kingdom, in which the *skeleton*, which is external, is formed of numerous pieces or segments, jointed or *articulated* together, as in the lobster, the centipede, &c. This division corresponds with the *Annulosa* of Macleay, the *Homogangliata* of Owen, and the *Diploneura* of Grant.

ARTOCA'RPEÆ. The *Artocarpus*, or Bread-fruit tribe of Dicotyledonous plants; a division of the Urticaceæ, or Nettle tribe, distinguished by their consolidated flowers and milky juice.

ASBE'STOS (α, priv., σβέννυμι, to extinguish). A mineral substance, of a fibrous structure, from which an incombustible linen is made. There are several varieties, all more or less flexible and fibrous, and termed common asbestos, amianthus, mountain leather and paper, and mountain wood.

ASCENDING SIGNS. The signs are said to be *ascending*, when they are eastward from the meridian, and are, consequently, approaching the meridian through the effect of the diurnal rotation of the earth.

ASCE'NSION, RIGHT (*ascendo*, to rise). An astronomical term, applied to those arcs in the heavens which correspond to *longitudes* on the earth. Hence the *right ascension of a star* denotes the arc of the equator intercepted between the first point of Aries and that point of the equator which comes to the meridian at the same instant with the star.

1. *Oblique Ascension* is a term nearly out of use. It is an extension of the *right ascension* to the *oblique* sphere, in which one pole is above the horizon, and the other below it. The *oblique ascension of a star* is the arc of the equator intercepted between the vernal equinox and that point of the equator which comes to the horizon at the same time with the star.

2. *Ascensional Difference* is also a term nearly out of use. It denotes the difference between the oblique and the right ascensions, and is chiefly used in respect to the sun, because, when the arc which it expresses is turned into time, it shows the time before or after six o'clock of sunrise.

A'SCI (ἀσκὸς, a leathern bag). The

botanical designation of the sporuliferous *tubes* imbedded in the nucleus of the shields of lichens.

ASCI'DIA (ἀσκὸς, a bottle). An order of the tunicated *Mollusca*, named from their resemblance in shape to a leathern bottle. In these, the two orifices approach one another more or less closely, and the body is either immediately fixed to some solid mass, or attached to it by a foot-stalk. See *Salpæ*.

ASCIDIOI'DA (*ascidia*, and εἶδος, likeness). An order of the Polypipherous Radiata, named from their affinity to the *ascidiæ*, a group in the lowest class of Mollusca. They have also been called *bryozoa*, from their fancied resemblance to mosses, and *cilio-brachiata*, from the presence of cilia on their arms.

ASCI'DIUM (ἀσκίδιον, dim. of ἀσκὸς, a leathern bag). The botanical term for the pitcher of Nepenthes and other plants, consisting in a peculiar modification of the leaf, by which the petiole is dilated and hollowed out at its upper end, and the lamina is articulated with it and closes its orifice.

A'SCII (α, not, σκιὰ, shadow). A term applied to the inhabitants of the Torrid Zone, because, the Sun being sometimes exactly vertical to them at noon, they have *no shadow* at all. At the other times of the year, their noon-shadow points both northward and southward, according to the place of the sun, when he is not vertical to them; and hence they are called *Amphiscii*, from ἀμφὶς, on both sides, and σκιὰ, shadow,

1. *Heteroscii* (ἕτερος, another, σκιὰ, shadow). A term applied to the inhabitants of the Temperate Zones, from their having their shadows, at noon, always *on one side or other of them*, either north or south, according as they may be situated, throughout the whole year.

2. *Periscii* (περὶ, around, σκιὰ, shadow). A term applied to the inhabitants of the Frigid Zones, because at certain seasons of the year, during many revolutions of the earth, the sun does not set at all to them, nor so much as touch the horizon, and hence *their shadows move completely round them* once in 24 hours; and, in proportion as they are nearer the Poles, will be the greater continuance of the sun above the horizon, for one, two, or, it may be, six months together.

3. To these may be added the *Brachyscii* (βραχὺς, short), or such as project short shadows at noon: the *Macroscii* (μακρὸς, long), who project long shadows at noon; and the *Antiscii* (ἀντὶ, opposite), whose shadows are in opposite directions, from their having the sun on opposite sides.

4. The ancients, likewise, distinguished the inhabitants of the earth, with respect to their longitude and latitude, into the *Periœci* (περὶ and οἶκος, habitation), who dwelt in the same latitude, but in opposite longitudes; the *Antœci* (ἀντὶ and οἶκος), who dwelt in the same longitude, but in opposite latitudes; and *Synœci* (σὺν and οἶκος), who lived in the neighbourhood of each other. The Antipodes had both latitudes and longitudes *diametrically* opposite to each other.

ASCLEPIADA'CEÆ. The Asclepias tribe of Dicotyledonous plants. Shrubs or herbaceous plants, with *leaves* opposite, alternate, or whorled; *corolla* monopetalous, hypogynous; *stamens* inserted into the base of the corolla; *ovaries* two; *fruit* one or two follicles.

ASE'PTIC (α, priv., σήπω, to putrefy). A term applied to substances which are free from the putrefactive process.

ASPA'RAGIN. A crystalline substance, formed spontaneously in the juice of *asparagus* which has been evaporated to the consistence of syrup. It is generally procured from the root of the marshmallow.

ASPA'RAMIDE. A principle discovered in the juice of the asparagus, and in the root of the marsh-mallow and liquorice. It is the *agedoite* of Robiquet, and synonymous with *asparagin*.

ASPA'RTIC ACID. An acid obtained from asparagin, when boiled for some time with hydrated oxide of lead or magnesia.

A'SPECT. An obsolete astronomical term, applied to the various positions of the planets with respect to one another, as seen from the earth. Five aspects have been reckoned: at *conjunction*, ☌, two planets have the same longitude; when sixty degrees apart, the aspect is *sextile*, ⚹; when ninety, *quartile*, □; when 120, *trine*, △; when 180 degrees apart, they are in *opposition*, ☍.

ASPERGI'LLIFORM (*aspergillus*, a brush, *forma*, likeness). Brush-like; divided into minute ramifications, as the stigmas of grasses, certain hairs of the cuticle of plants, &c.

ASPHA'LTENE. A solid black substance, obtained by submitting the bitumen of Bechelborum, purified by ether, to a high and prolonged temperature.

ASPHA'LTUM (ἄσφαλτος, asphalt, bitumen). A black or brown, brittle substance, also called *bitumen Judaicum*, or Jews' pitch, forming in lumps on the surface of some waters, especially near Babylon, and employed by the Egyptians for embalming, under the name of mumia mineralis.

ASPHODE'LEÆ. The Asphodel or Lily tribe of Monocotyledonous plants. Herbaceous plants, with *bulbs*, occasionally arborescent, with *leaves* not articulated with the stem, parallel-veined; *flowers* hexapetaloïdeous; *stamens* hypogynous; *ovary* superior; *fruit* succulent or dry and capsular.

ASSA'YING. The chemical operation of ascertaining the quantity of any metal in an ore or mixture. It differs from Analysis only in degree, and is performed in the *dry way*, as by heat; in the *moist way*, as by acids and other re-agents; or by both methods. See *Cupellation*.

ASSIMILA'TION (*assimilo*, to liken to). The function by which organized bodies convert aliment into their own proper substance.

ASSOCIATE MOVEMENTS. *Consensual Movements*. Those movements which, contrary to our will, accompany other, voluntary, motions. Thus, the eye cannot be moved inwards by the action of the rectus internus, without contraction of the iris being produced.

ASTA'TIC (α, priv., στάω, to stand). A term applied to a *magnetic needle*, when its directive property is destroyed by the proximity of another needle of equal magnetic intensity, fixed parallel to it, and in a reversed position, each needle having its north pole adjacent to the south pole of the other. In this state the needles, neutralizing each other, are unaffected by the magnetism of the earth, while they are still subject to the influence of galvanism.

ASTE'RIA (ἀστὴρ, a star). A variety of sapphire, showing a star-like opalescence in the direction of the axis, when cut round.

ASTE'RISM (ἀστὴρ, a star). A small cluster of stars, either distant from, or forming a part of, a constellation.

ASTEROI'DA (ἀστὴρ, a star, εἶδος, likeness). An order of the polypipherous Radiata, named from the star-shaped form presented by the tentacula, when expanded. They may be also termed *Alcyonian* polypiphera, from the name of one of the principal groups.

A'STEROIDS (ἀστὴρ, a star, εἶδος, likeness). A term applied by Herschel to the recently discovered planets, Ceres, Juno, Pallas, and Vesta, and including those celestial bodies which move in orbits of any eccentricity round the sun, whatever angle their orbits make with the ecliptic, whether the motion of these bodies be direct or retrograde, whether they have or have not atmospheres.

ASTRI'NGENT PRINCIPLE. A principle existing in the gall-nut and other substances, and characterized by the property of contracting the muscular fibre. From the use of this principle in tanning skins, it has been called *tannin*.

A'STROLABE (ἄστρον, a star, λαμβάνω, to take). *Planisphere*. A projection of the sphere upon the plane of one of the great circles: it is furnished with a graduated rim, to which sights are added, for the purpose of taking altitudes.

ASTRO'LOGY (ἄστρον, a star, λόγος, an account). A term strictly meaning *the science of the stars*, but applied to the pretended discovery of future events by means of the position of the heavenly bodies.

ASTRO'NOMY (ἄστρον, a star, νόμος, a law). The science which treats of the motions, the distances, the size, the physical constitution, the eclipses, and all other phenomena of the heavenly bodies. By the term *astra*, the ancients understood not only the *stars*, properly so called, but also the sun, the moon, and all the bodies which compose the visible universe.

1. *Descriptive* astronomy demonstrates the magnitudes, distances, and densities of the heavenly bodies, and explains the phenomena dependent on their motions, as the change of seasons, and the vicissitudes of day and night.

2. *Physical* astronomy explains the theory of planetary motion, and the laws by which this motion is regulated and sustained.

3. *Practical* astronomy details the description and use of astronomical instruments, and develops the nature and application of astronomical calculations.

ASY'MPTOTES (ἀσύμπτωτος, that which does not fall with). A term applied to two lines (one of which, at least, must be a curve), which, although continually approaching nearer and nearer, and although indefinitely produced, never meet each other. This properly occurs in the hyperbola, and appears of a paradoxical character.

ATA'CAMITE. A native muriate of copper, found in the desert of Atacama, between Chili and Peru. It occurs in a compact and in an arenaceous form; in the latter, it is termed *copper sand.*

A'THANOR. An ancient kind of furnace, so constructed that the fire should be constantly supplied with fuel in proportion to the consumption.

ATHERI'CERA (ἀθὴρ, an ear of corn, κέρας, a horn). A section of Dipterous insects, in which the antennæ have only two or three joints, the last being furnished with a bristle. It includes the Flies, strictly so called, the Bot-flies, &c.

ATHE'RMANOUS (α, priv., θέρμη, heat). A term applied to those substances which retain all the heat they receive, as distinguished from *diathermanous* bodies, which transmit all the rays of heat through their substance.

ATMO'METER (ἀτμὸς, vapour, μέτρον, measure). An instrument for measuring the quantity of exhalation from a moist surface in a given time.

A'TMOSPHERE (ἀτμὸς, vapour, σφαῖρα, a sphere). That volume of air which surrounds the earth. Its mean height has been estimated at from 44 to 47 miles, its volume as the twenty-ninth of that of the globe, and its weight only forty-three thousandths.

1. *Atmospheric Pressure* is indicated by the length of a column of mercury. A mercurial column, 30 inches in length, presses on a given surface with the same force as the atmosphere in its ordinary state; and hence the force of a 60-inch column is equal to the pressure of *two atmospheres;* that of 15 inches, to half an atmosphere; that of one inch, to 1-30th of the atmospheric pressure.

2. *Atmospheres—two, three, &c.* Multiplied pressures of air arising from condensation, the ordinary pressure being fifteen pounds on the square inch. Pressures arising from other causes, as the weight of liquids and the force of steam, are also frequently counted by atmospheres.

3. *Atmosphere, refraction of.* A term expressive of the refraction of the rays of light, as they pass from the celestial bodies into the atmosphere, owing to its being denser than the ethereal or vacuous medium which intervenes between it and the celestial bodies. This refraction varies with the density of the atmosphere, and also with the direction in which the rays enter. The atmosphere gradually increases in density from the higher to the lower strata; and, therefore, a ray of light will be more and more refracted in its passage to the earth's surface, so as to descend in a *curved* line. The curve, too, varies with the direction of the ray, that coming from the zenith alone being a straight line.

4. *Atmosphere, electrical.* The distance at which an electrified body is capable of resolving the neutral electricity of unelectrified bodies into its elements, when brought into proximity to the former, is termed the *electrical atmosphere* of that body.

5. *Atmosphere, magnetic.* The range within which a magnet exerts its influence in any magnetizable body within a certain distance of itself, is termed its *circle of magnetic influence*, or its *magnetic atmosphere.*

ATMOSPHERIC ENGINE. A term applied to the *single-action steam-engine*, in which only the *ascent* of the piston is effected by means of steam, its *descent* being mainly effected by the pressure of the atmosphere.

A'TOLLS. Coral-islands, or lagoon-islands, of an annular form, or consisting of a circular strip or ring of coral surrounding a central lagoon.

A'TOM (α, priv., τέμνω, to cut). An ultimate particle of matter, incapable of further division. Berzelius distinguished atoms into *elementary* and *compound.* The latter are subdivided into, 1. *Compound atoms of the first order*, or atoms formed of only two elementary substances united; 2. *Organic atoms,* or those composed of more than two elementary substances, and found only in organic bodies, or bodies obtained by the destruction of organic matter; and, 3. *Compound atoms of the second order*, or those formed by the union of two or more compound atoms, as the salts.

ATO'MIC THEORY. A theory for explaining the nature of matter, founded by Leucippus. He considered the basis of all bodies to consist of extremely fine particles, differing in form and nature, which he supposed to be dispersed throughout space, and to which his follower Epicurus first gave the name of *atoms.* To these atoms he attributed a rectilinear motion, in consequence of which such as are homogeneous united, whilst the lighter were dispersed throughout space. See *Dynamic Theory.*

ATO'MIC WEIGHTS. An expression connected with the theory that all bodies consist of *atoms*, which are of the same size and shape in the same body, but which differ in *weight* in different bodies. The weight of an atom of oxygen is eight times as great as that of an atom of hydrogen, and half as great as that of an atom of sulphur. On this theory are founded three universal laws :—

1. *That the parts by weight in which bodies mutually combine, stand in a fixed numerical relation to each other.*

2. *That in every chemical combination the parts by weight of one element may be represented by certain weights of other substances.*

3. *That the weights which mutually represent one another at once furnish the proportion in which these equivalent substances combine.*

ATRA'CHIA (α, priv., τράω, to perforate). A tribe of bivalved Mollusca, which are destitute of siphons for imbibing food. See *Macrotrachia.*

ATRACTE'NCHYMA (ἄτρακτος, a spindle, ἔγχυμα, an infusion). A term applied by some botanical writers to the *fusiform*, or spindle-shaped, variety of spheroidal cellular tissue.

A'TROPOUS (α, priv., τρέπω, to turn). That which is not inverted, as applied in Botany to the erect ovule. In this case, the parts of the ovule undergo no alteration of position during their growth, and thus the two sacs and the nucleus are all connected at the base of the ovule. The term is synonymous with *orthotropous.*

ATTE'NUATE (*ad*, to, *tenuis*, thin). Tapering ; gradually diminishing in breadth, and terminating in a point.

ATTENUA'TION (*attenuo*, to make thin). The process by which a fluid becomes of less specific gravity, as when it undergoes fermentation, and parts with carbonic acid.

ATTRA'CTION (*attraho*, to draw to). A general term denoting the mutual tendency of bodies towards one another, and explanatory of certain physical and chemical properties of matter.

1. *Attraction of Cohesion.* The tendency of the *particles* of bodies to *cohere*, and form masses. On the degree of this force depend the three *aggregate forms* of matter, which are distinguished as the solid, the liquid, the gaseous. Cohesion is the antagonist of affinity.

2. *Attraction of Gravitation.* The mutual tendency of the *masses* of bodies towards one another. *Universal gravitation* relates to the mutual action of the celestial bodies on each other and the gravitation of our earth ; *terrestrial gravity* relates to the mutual operation of terrestrial objects, or to the effects which the earth produces on all bodies more immediately connected with it. Cohesion operates at *sensible*, gravitation at *insensible* distances.

3. *Attraction of Affinity.* The tendency of the *atoms* of dissimilar bodies to combine and form chemical compounds. This force effects the *combination* and *decomposition* of dissimilar bodies, with the production of individual properties distinct from those which they had in their former state. See *Affinity.*

4. *Attraction, Capillary.* The power by which a liquid ascends in the interior of a capillary tube, or tube of small bore, above the surface of the liquid which surrounds it. The phenomenon occurs in solid bodies which are capable of being wetted.

5. *Attraction, Superficial.* A term sometimes applied to that modification of the adhesion of bodies which is caused not merely by the mass of bodies, but also by the number of points of contact, or the extent of their touching surfaces.

6. *Attraction, Electrical.* The force which is exhibited in the tendency of the free positive and negative electricities to regain their equilibrium by combination each with its antagonist. Hence, electrified bodies attract all other non-electrified bodies, and all oppositely electrified bodies, in order to saturate themselves with the opposite electricity and regain electrical quiescence.

7. *Attraction, Electrodynamical.* A term expressive of Ampère's discovery, that "the electricities in a state of motion, *i. e.* as electric currents, act attractively and repulsively on each other according to a certain law," in a manner resembling the polar attraction of statical electricity, *i. e.* of electricity in a state of tension.

8. *Attraction, Magnetic.* The property by which bodies endowed with magnetism attract certain metals; display towards one another a force partly attractive, partly repulsive ; and exhibit a tendency to arrange their mass in a certain direction.

ATTWOOD'S MACHINE. A machine invented by Mr. Attwood for calculating exactly the velocity of a falling body from an actual measurement of its height, and the time which it takes to reach the ground.

AU'GITE (αὐγή, lustre). *Pyroxene.* A simple mineral, of a dark-green or black colour, with an internal shining lustre, forming a constituent part of many varieties of trap and volcanic rocks. It is a silicate of lime and magnesia. *Augite rock* is a particular kind of trap rock, consisting of augite and compact felspar, the former being predominant or in equal proportion.

AURA ELECTRICA. A gale of electricity; a term expressive of electricity, as received from a point, from the sensation it communicates.

AURA'NTIA'CEÆ. The Orange tribe of Dicotyledonous plants, abounding in a volatile, fragrant, bitter, exciting oil. Trees or shrubs with *leaves* alternate, often compound, dotted with transparent receptacles of volatile oil; *flowers* polypetalous; *stamens* hypogynous; *ovary* many-celled; *fruit* pulpy, many-celled, its rind filled with receptacles of oil.

AURE'LIA (*aurum*, gold). *Chrysalis.* A fanciful name for the nymph or *pupa* state of insect life, from the glittering spots of golden hue with which it is sometimes speckled.

AU'RIC ACID (*aurum*, gold). Auric oxide. A name proposed by Pelletier for the peroxide of gold, from its property of forming salts with alkaline bases.

AURI'CULATED (*auricula*, a little ear). A term applied to a few bivalves which have a flat angulated projection on one or both sides of the umbones or bosses. These processes are highly developed in the *pecten*, and are merely an incipient modification of the hinge margin in *byssoarca* and several other genera. The term is also applied, in Botany, to leaves which have two rounded lobes at the base.

AU'RIFORM (*auris*, the ear, *forma*, likeness). Ear-shaped; as applied to the *haliotis* among the mollusca.

AURI'GA. The Charioteer; a northern constellation, consisting of sixty-six stars, the principal of which is Capella.

AURO'RA BOREA'LIS. *Northern Lights; Polar Lights*, or *Streamers.* A luminous meteor, generally appearing in the northern part of the sky, and resembling the *Aurora*, or morning twilight. It is usually referred to the agency of electricity in the upper regions of the atmosphere.

AUSTRAL. The six signs of the zodiac, which are south of the equinoctial, are called *Austral signs.*

AUTHORITY. 1. This term is employed in its primary sense, when we refer to any one's example, testimony, or judgment; in this sense it answers pretty nearly to the Latin *auctoritas.* 2. Sometimes it is employed as equivalent to "potestas," power; as when we speak of the authority of a magistrate.

AUTO'MALITE. *Fahlunite.* A mineral found in a talcose rock at Fahlun in Sweden. Its constituent parts are alumina, silica, and the oxides of zinc and of iron.

AUTOMA'TIC MOTIONS (*αὐτόματος*, self-moving). Those muscular actions which are not dependent on the mind, and which are either persistent, or take place periodically with a regular rhythm, and are dependent on normal causes seated in the nerves or the central organs of the nervous system.

AUTUMN. The third quarter of the year, which begins when the sun enters *Libra*, that is, about the 21st or 22nd of September, when the days and nights are equal.

AUTUMNAL EQUINOX. The time when the sun enters *Libra*, or the descending point of the ecliptic, called also the *Autumnal point.* The signs *Libra*, *Scorpio*, and *Sagittarius*, are called autumnal signs.

A'VALANCHE. A mass of snow which, being detached from a great height in the Alps, acquires enormous bulk by accumulation as it descends. It is termed, in the dialects of Switzerland, *lavange* and *lavanche.*

AVA'NTURINE. A variety of quartz containing mica spangles.

A'VES (*avis*, a bird). The fourth class of the Vertebrata, or *Encephalata*, comprising birds; a class of oviparous animals, with warm blood, a double circulation, a covering of feathers, and arms constructed for flight.

AVICU'LIDÆ. Mussels and Pearl Oysters; a family of the atrachian bivalves, named from the genus *avicula;* the animal is attached, and byssiferous; the shells are lamellar, internally perlaceous; the valves generally gaping.

AWN. A stiff bristle, formed by a continuation of the midrib of a bract in certain grasses, and commonly called the *arista* or *beard.*

AXE-STONE. A sub-species of jade, used by the New Zealanders for making hatchets. It is sometimes called *Amazonian stone*, from its being found on the banks of the river Amazon.

AXI'LLA. The Latin term for the arm-pit, and applied to other parts of the animal body which form a similar angle. In Botany, it denotes the angle made by a leaf-stalk with the stem, the normal position of the bud, which is hence called *axillary*.

A'XINITE (ἀξίνη, an axe). *Thumerstone.* A mineral found at Thum in Saxony, and named from the resemblance of its crystals to an axe in the form and sharpness of their edges.

A'XIOM (ἀξίωμα, dignity). A self-evident proposition, incapable of being established by proof, and assumed as the basis of demonstration.

A'XIS (ἄξων, the axle-tree of a chariot). A term applied to an imaginary straight line passing through the centre of a body, and on which the body turns. The *axis of the earth* is a line of this kind passing from one pole to the other; and, if we suppose this line to be extended in both directions, it will become an *axis of the heavens*, and will mark two points which are also called poles, around which, or rather their line of junction, all the fixed stars appear to revolve.

1. *Axis, rotation on.* The different points of a body may at the same time move in different directions; this is called a rotatory motion. *Rotation on an axis* implies, in addition to this rotatory motion, that all the parts of the body shall revolve around an imaginary right line in a state of rest, called the *axis.*

2. *Axis, free* or *moveable.* A term applied to an axis which is free from all pressure, in consequence of the mass of the body surrounding it being so equally arranged about it, that the centrifugal forces of its particles mutually counteract one another. The axis of the earth is a free or moveable axis.

3. *Axis of refraction.* The right line drawn perpendicular to the surface of the refracting medium through the point of incidence of the refracted ray. Of crystals which possess the property of *double refraction*, many, like Iceland spar, have only *one axis* of double refraction; others have *two axes*, which are variously inclined to each other, as the topaz. When the ray of extraordinary refraction is inclined from the axis, the crystal is said to have a *negative axis;* when it is inclined towards it, more than the ordinary ray, the crystal is said to have a *positive axis.*

4. *Axes of crystals.* The lines which join the points, and pass through the middle of a crystal, are called its axes. Most of these bodies have three such axes at right angles to each other: that which is most unlike the other two, is called the *principal axis*, and the other two *secondary* or *subordinate axes.*

5. *Axis of a lens.* A right line drawn through the optical centre of the lens, and perpendicular to both its surfaces. At this point no refraction is produced on perpendicular rays.

6. *Axis of a spherical mirror.* A right line which passes through the geometrical and the optical centres of the mirror.

7. *Axis of a cone.* A right line drawn from the vertex of the cone to the centre of its circular base.

8. *Axes of an ellipse.* These are called the *major* and the *minor axes*, and they are respectively synonymous with the *transverse* and the *conjugate diameters.*

9. *Axis of a paralola.* The line which, passing through the vertex of the parabola, divides the figure into two equal and similar portions.

10. *Axis of a magnet.* The imaginary line which connects the north and south poles of a magnet.

11. *Axis anticlinal.* The imaginary line lying between the strata which dip in opposite directions on the two sides of a hill or of a valley. In a row of houses with steep roofs facing the south, the slates represent inclined strata dipping north and south, and the ridge is an east and west anticlinal axis.

A'YMESTRY LIMESTONE. A group of the Ludlow rocks, consisting of grey or bluish argillaceous limestone, full of the remains of shells and corals.

A'ZIMUTH. An Arabic term denoting the angular distance of a celestial object from the north or south point of the horizon, when the object is referred to the horizon by a vertical circle. Or, it is the angle comprised between two vertical planes, one passing through the elevated pole, the other through the object.

1. *Azimuth circles.* Great circles of the sphere, passing through the zenith, and intersecting the horizon at right angles.

2. *Azimuth compass.* A compass used at sea for finding the horizontal distance of the sun or a star from the magnetic meridian.

3. *Azimuth dial.* A dial of which the style or gnomon is perpendicular to the plane of the horizon, and so called from its shadow marking the sun's azimuth.

A'ZOTANE. Chloride of azote. The term is derived from Davy, who proposed to designate the compounds of chlorine by the termination *ane.*

A'ZOTE (α priv., ζωή, life). A gas constituting 73 per cent. of the atmosphere, and thus named from its being incapable of supporting respiration. It is more commonly called *nitrogen*, from its being the basis of nitric acid.

AZO'TIC and AZO'TOUS ACIDS. Names given by Thénard to the nitric and the nitrous acids, respectively, of other chemists. The latter acid was termed hyponitrous by Turner.

A'ZURE. A fine blue pigment, commonly called *smalt*, consisting of a glass coloured with oxide of cobalt, and ground to an impalpable powder.

AZURE STONE. *Lapis lazuli.* An azure blue mineral, from which ultramarine is prepared.

A'ZURITE. *Prismatic azure spar*, or *Lazulite.* A mineral occurring in mica slate, and consisting of alumina, silica, magnesia, lime, and oxide of iron.

B

B. in astronomical tables, stands for Bissextile, or Leap-year.

BA'BINGTONITE. A crystalline mineral, associated with cleavlandite, flesh-coloured felspar, and green amphibole.

BA'CCA. A berry; an inferior, indehiscent, pulpy fruit, as the gooseberry. The seeds lose their adhesion when ripe, and lie loose in the pulp. The term is, however, differently employed by some botanical writers. Link applies the term *bacca sicca* to a fruit which is fleshy when unripe, dry when ripe, and then distinguishable from the capsule by not being brown.

BA'CCATE (*bacca*, a berry). Berried; having a juicy succulent texture, as the calyx of blitum.

BACK STAFF. An instrument invented by Capt. J Davis for taking the sun's altitude at sea. In using it the observer was obliged to turn his back to the sun. It is now superseded by the quadrant and the sextant.

BACONIAN PHILOSOPHY. A system of philosophy founded on induction, enforced by the talent and writings of Francis Bacon, Lord Verulam. This system holds an intermediate place between the merely empirical and the dogmatical schools. "While the one," he observes, "like ants, content themselves with heaping up materials for immediate use, the latter, after the manner of spiders, spin webs out of their own brain. There is a better and a middle way—that of the bee, which derives, indeed, its material from the flowers of the garden and the field, but converts and digests it by its own proper virtue."

BA'CULITE (*baculus*, a staff). An extinct genus of Molluscous animals, allied to the Nautilus, which inhabit a straight-chambered shell resembling a staff.

BAI'KALITE. A light-green variety of augite, found at the mouth of a river which flows into lake Baikal in Siberia.

BA'LA LIMESTONE. A dark-coloured slaty limestone, forming a subordinate portion of the Cambrian group of rocks. In Westmoreland it is 100 feet in thickness, and both there and in Wales contains organic remains.

BALÆ'NIDÆ (φάλαινα, *balæna*, a whale). The Whale tribe of cetaceous Vertebrata, in which the head constitutes one-third, or even one-half, of the entire length. By this disproportionate size they are distinguished from the *Delphinidæ*, or Dolphin tribe. By the term *balænoptera* (πτερὸν, a fin), De Lacépède distinguished from the other balænæ those whales which have an adipose fin on their back, and are hence called *finners* by sailors.

BALANCE (*bilanx*, from bis and lanx, *i. e.* a duabus lancibus, a beam with balances). One of the simple mechanical powers, consisting of a lever turning on a pivot or *fulcrum*, and constructed for the purpose of finding the weight of different bodies. The lever, or rod, of a balance is termed the *beam*, and the parts of the beam on each side of the pivot on which it turns are its *arms*. In the common balance those arms are equal, and balance each other; and its ends, to which the body to be weighed and its equivalent counterpoise are hung, are called the *points of suspension*.

1. *Roman Balance*, or *Steel-yard*. This kind of lever differs from the common balance, in having its support near one

end, instead of in the middle; and also, in having the weights suspended by hooks instead of being placed in a dish. Here the fulcrum is between the power and the weight. This is the principle also of the *Chinese balance.*

2. *Danish Balance.* This kind of lever consists of a bar of wood or iron, having a leaden weight at one extremity, and the goods to be weighed fixed in a hook at the other. The bar is suspended by a loop, which is moved backward and forward until the equilibrium is obtained. The weight of the goods and the leaden weight are then to each other reciprocally as their respective distances from the loop.

BALANCE ELECTROMETER. An instrument constructed on the application of the common balance and weights, for the purpose of estimating the mutual attraction of oppositely electrified surfaces.

BALANCE OF TORSION. A delicate electrometer, invented by Coulomb, on the principle of establishing an equilibrium between the force of electricity and that of the torsion, or twisting, of a fibre of the web of the silk-worm.

BA'LANCERS. A term generally applied to the posterior pair of wings in Dipterous insects, in which they appear in the condition of minute clavate appendages.

BALANI'DA (*balanus*, an acorn). Acorn-barnacles; an order of Cirrhopods, named from the genus *balanus*, and characterized by their being enclosed in a conical shell, adherent by its base to foreign substances, and closed at its apex by four valves.

BA'LANOPHO'REÆ. A small family of leafless rhizanths, parasitical upon roots, named from the genus *balanophora,* and natives of the West Indies, South America, &c. Their properties are unknown.

BA'LAS RUBY. A technical term for the bright red varieties of the *spinèl,* a sub-species of ruby.

BALAU'STA (*βαλαύστιον*, the flower of the wild pomegranate). A term applied, in Botany, to the many-celled, many-seeded, inferior, indehiscent fruit of the pomegranate.

BALDWIN'S PHOSPHORUS. The ignited nitrate of lime. This salt derives its name from its property of emitting a beautiful white light in the dark, when kept in a stoppered phial, and exposed for some time to the rays of the sun.

BALLI'STIC PENDULUM (*βάλλω,* to throw). A heavy wooden pendulum, for measuring the velocity of cannon and musket balls, and for determining the resistance of the air to rapid motions. The mechanical problem to be solved is this:—Given, the weight of the shot, the place at which it strikes, the weight, form, &c., of the pendulum, and the number of vibrations produced upon it by the shot; required, the velocity of the shot.

BALLOON (*ballon,* French, a little ball). A chemical instrument or receiver, of a spherical form, for condensing vapours from retorts. The term *balloon* signifies any spherical hollow body, of whatever material composed, or to whatever purpose applied: in its most common use, it denotes a machine for navigating the air.

BA'LSAMS. Vegetable juices, either liquid, or becoming spontaneously concrete, and consisting of ethereal or essential oils with resin and *benzoic acid.* The *liquid* balsams are copaiva, opobalsam, balsam of Peru, storax, and Tolu; the *concrete* are benzoin, dragon's blood, and red or concrete storax. Those compounds which have no benzoic acid are miscalled balsams, being, in fact, true turpentines.

BALSAMA'CEÆ. *Balsamifluæ.* An order of Dicotyledonous plants, found in tropical India, and characterized by their balsamic products. The fragrant resin *storax* is yielded by several species of Liquidambar, the only genus of the order.

BALSAMINA'CEÆ. The Balsam tribe of Dicotyledonous plants; a small order of plants, closely allied to the *Geraniaceæ,* and chiefly remarkable for the elastic force with which the valves of the fruit separate when ripe, and expel the seeds.

BANDA'NA. A mode of calico printing practised in India, by which white or brightly coloured spots are produced upon a red or dark ground.

BARBA'DOS TAR. *Petroleum.* A species of bitumen, differing from naphtha in its greater weight and impurity.

BARDIGLIO'NE. A blue variety of anhydrite, cut and polished for ornamental purposes.

BARI'LLA. The commercial name of the impure carbonate of soda extracted from the ashes of the plants salsola and salicornia, and imported from Spain or the Levant. Kelp, or *British barilla,* is a more impure alkali, made in this country by burning various sea-weeds.

BA'RIUM (βαρὺς, heavy). A peculiar metal, the basis of the alkaline oxide or earth barytes, named from the great density of its compounds.

BARK OF PLANTS. The external envelope of trees and shrubs. It was formerly distinguished into an external *cortical* or *cellular* integument, and an *internal* or *fibrous* portion, called liber. More recently, bark has been distinguished into four portions :—

1. *Epidermis.* The external and cellular envelope, continuous with the epidermis of the leaves. This is never renewed; the following parts increase by successive additions to their interior.

2. *Epi-phlœum* (ἐπὶ, upon, φλοιὸς, bark). A cellular portion lying immediately under the epidermis. Cork is the epiphlœum of the Quercus suber.

3. *Meso-phlœum* (μέσος, middle, φλοιὸς, bark). A cellular portion, lying immediately under the epiphlœum. This portion differs from the preceding in the direction of its cells.

4. *Endo-phlœum* (ἔνδον, within, φλοιὸς, bark). The liber, part of which is cellular, part woody.

BA'ROLITE (βαρὺς, heavy, λίθος, a stone). Heavy stone ; a carbonate of baryta.

BARO'METER (βάρος, weight, μέτρον, a measure). An instrument for *measuring the weight* or pressure of the atmosphere, by balancing a column of air against a column of mercury; and, by that test, measuring heights and depths, determining variations in the state of the air, and foretelling changes in the weather. When employed for determining the degree of rarefaction attained in the receiver of an air-pump, it is called a *barometer-gauge.*

1. The *cistern barometer* is a Torricellian tube, whose open end is immersed in a wider cistern of mercury. The zero point is on a level with the surface of the mercury. This is the oldest form of the instrument.

2. The *common barometer* is a Torricellian tube, whose open end is turned up and is of a spherical form. The globe performs the office of the cistern described in the preceding barometer: the scale is graduated from the same point in both these instruments.

3. *De Luc's syphon barometer* consists of a glass tube bent upwards so as to form two parallel legs : the longer is hermetically sealed, and constitutes the Torricellian tube; the shorter is open, and on the surface of the mercury the pressure of the atmosphere is exerted. The difference between the levels in the two legs is the barometric height.

BA'ROMETZ (*baronez*, Russian, a little lamb). A species of *Aspidium*, or shield fern, which, from its procumbent position and shaggy appearance, has acquired the name of "Scythian lamb," and the credit of possessing some of the properties of this animal.

BA'ROSCOPE (βάρος, weight, σκοπέω, to perceive). A *perceiver of weight ;* a term sometimes applied to the barometer. Etymologically speaking, a baroscope is not a barometer, though a barometer is a baroscope.

BA'RRAS, or GALIPOT. The resinous incrustation on the wounds made in fir-trees.

BA'RRIER REEF. A coral production, similar to the Atoll, or coral island. It runs parallel with the shores of a larger island or continent, separated, however, from the land by a broad and deep lagoon channel, and having the outer side as steep as in the lagoon islands.

BA'RTER. A rule in Arithmetic, by which the values of commodities of different kinds are compared, for the purpose of exchange.

BARYSTRO'NTIANITE. *Stromnite.* A mineral found in veins, or rather nests, accompanied by galena, at Stromness, in Orkney. It consists of the carbonates of strontia and of lime, sulphate of baryta, and oxide of iron.

BARY'TES (βαρὺς, heavy). *Baryta.* The protoxide of barium, an alkaline earth, the *heaviest* of all the earths, and a violent poison. The native sulphate is called *heavy spar*, or *cawk.* The native carbonate has been named, after Dr. Withering, its discoverer, *witherite.* A solution of barytes in water is called *barytes water*, and is used as a chemical re-agent.

BARY'TIN. A new vegetable base, discovered in the rhizome of *Veratrum album*, and named in consequence of its being precipitated from its solution, like baryta. See *Jervin.*

BARY'TO-CALCITE. A mineral found in Cumberland, consisting of the carbonates of baryta and of lime, with an outer coating of sulphate of baryta.

BA'RYTON (βαρὺς, heavy, τόνος,

tone). *Baritone.* That compass of the male voice which is between those of the tenor and of the base. The term *bari-tenor*, employed by Bennati, is preferable, as it expresses what is really meant, viz. a high base.

BA'RYTONE VERBS (βαρὺς, heavy, τόνος, tone). That class of Greek verbs which terminate in ω, and have either a consonant before ω, or a vowel α, ε, ο, before ω. These are called barytone, because they have the accent (*acute*) on the penultima, and the last syllable necessarily has the *grave* accent, not expressed in writing.

BA'SALT (*basal*, iron, Ethiopian). One of the most common varieties of the Trap-rocks. It is a dark green or black stone, composed of augite and felspar, very compact in texture, and of considerable hardness, often found in regular pillars of three or more sides, called *basaltic columns*. These occur in the Giants' Causeway, and at Fingal's Cave in Staffa. The rock often contains much iron. *Basaltic hornblende* occurs in various basaltic and floetz trap-rocks.

BA'SANITE (βασανίζω, to test, from βάσανος, a Lydian stone). A stone by which the purity of gold was formerly tested; it consists of silica, lime, magnesia, carbon, and iron.

BASE *or* BASIS (βάσις, a base). A chemical term applied to alkalies, earths, and metallic oxides, in their relations to the acids and salts. It is sometimes also applied to the particular constituents of an acid or oxide, on the supposition that the substance combined with the oxygen, &c. is the basis of the compound to which it owes its particular qualities. This notion seems unphilosophical, as these qualities depend as much on the state of combination as on the nature of the constituent.—*Ure.*

1. In the Arts, the term *base* is synonymous with *mordaunt*, and is applied to a substance used in dyeing, which has an affinity for both the cloth and the colouring matter.

2. In Malacology, the term *base* is generally used in opposition to the *apex*, or pointed extremity of univalve shells. In bivalves which adhere to other substances by one of their valves, as in spondylus, that which adheres is termed the *basal* valve; in unattached bivalves, the term is not correctly admissible. In spiral shells, the last or largest whorl is termed the *basal* whorl.

3. In Geometry, the *base* is the lowest side of the perimeter of any figure. The base of a triangle is, properly, the side which is parallel to the horizon, though the term may be applied to either of the other sides. In rectangled triangles, the base is, properly, the side opposite to the right angle.

BASE VOICE. The lowest compass of the human voice, usually ranging from G or F below the base staff to D or E above it.

BASIC WATER. A term applied in cases in which water appears to act the part of a *base:* phosphoric acid, for instance, ceases to be phosphoric acid, unless three equivalents of water to one of acid be present.

BASI'DIA. Small bases; a term applied to the cells on the apex of which the spores of fungaceous plants are formed.

BASIGY'NIUM (βάσις, a base, γυνὴ, a female). *Podogynium.* A botanical term applied to the long stalk upon which the ovary, instead of being sessile, is seated in certain plants, as in the Passion flower. It is frequently called the *thecaphore* and *gynophore.*

BA'SILAR (*basis*, a base). Belonging to the base; in Zoology, to that of the skull.

BA'SIN (*bassin*, French). A term applied, in Physical Geography, to the whole extent of country from which the waters of a particular river are drawn. In Geology, the term denotes those depressions of the surface of the earth in which waters accumulate so as to form *lakes:* of this kind are the lakes of North America, lake Aral, the Caspian and Dead Seas, &c.

Basins of Paris, of London. Deposits lying in a hollow or trough, formed of older rocks. The term *basin* is sometimes used, in Geology, almost synonymously with "formation," to express the deposits lying in a certain cavity or depression in older rocks.

BA'SSORINE. A substance extracted from the gum resins which contain it, by treating them successively with water, alcohol, and ether. Its name is derived from *bassora*, the gum in which it was first discovered.

BA'SYLE (βάσις, a base, ὕλη, nature or principle). A term proposed by Mr. Graham to denote the metallic radical of a salt. Thus, sodium is the *basyle* of sulphate of soda; soda is the *base*, and sulphatoxygen the *salt radical*, if the salt be viewed as consisting of sulphat-oxide of sodium.

BATH, CHEMICAL. An apparatus for modifying and regulating the heat in various chemical processes, by interposing sand or some other substance between the fire and the vessel intended to be heated. The *water bath*, formerly called balneum mariæ, and the *sand bath*, are most commonly used. *Solution baths*, consisting of saturated solutions, will produce temperatures as high as 360°. For higher temperatures, *metal baths* are employed, as of mercury, fusible metal, &c.; the temperature may thus be raised to 600°.

BATH, ELECTRICAL. This is administered by placing a person on an insulating stool, and directing the electric current from the conductor to different parts of the body by means of some pointed conductor.

BATRA'CHIA (βάτραχος, a frog). An order of the class *Reptilia*, comprising the frog, toad, salamander, and siren.

BATTERY, ELECTRICAL. An arrangement of Leyden jars which communicate together by both their inner and outer surfaces, and are thus rendered capable of being charged with electricity and discharged at the same time.

1. *Battery, Galvanic.* A combination of several pairs of zinc and copper plates soldered together, and so arranged that the same metal shall always be on the same side of the compound plate. A combination of this kind is sometimes termed a *compound hydro-electric battery*, or a voltaic pile or battery.

2. *Battery, Trough.* In this apparatus the zinc and copper plates are fastened to a slip of mahogany wood, and united in pairs by a piece of metal soldered to each. The whole are then placed in a trough of wood, or of Wedgewood's ware, divided into cells, so that each pair of plates shall enclose a partition of the trough, each cell of the trough containing a plate of zinc connected with the copper plate of the succeeding cell, and a plate of copper joined with the zinc plate of the preceding cell.

3. *Constant Battery.* A term applied to a battery in which the effect of the current is for a long time unimpaired, owing to the employment of concentrated nitric acid, by means of which the platinum, and by analogy the carbon also, become *depolarized* and relatively exalted in their electromotive functions. Of this kind are the batteries of Grove and Bunsen.

BAY. A projection of the ocean into the continent, of less expanse than that of a *sea*, but communicating with the ocean by a broader passage. See *Gulf*.

BAY SALT. A general name for coarse-grained salt, but particularly applied to salt obtained by spontaneous evaporation of sea-water in large shallow pits or *bays*.

BDE'LLIUM. A name applied to two gum-resinous substances. One of these is the *Indian bdellium*, or *false myrrh*, procured from the Amyris commiphora. The other is called *African bdellium*, and is obtained from the Heudolotia Africana.

BEAD-PROOF. A term denoting the strength of spirituous liquors, as shown by the continuance of the bubbles or beads on the surface.

BEARING. A term denoting, in Navigation, the situation of one place from another with respect to the points of the compass. Thus, if *A* lies in the direction of south-west from *B*, then to an observer at *B*, *A* is said to *bear* south-west, or to have a south-west *bearing;* while to an observer at *A*, the point *B* will *bear* north-east, or have a north-east *bearing*. To take *bearings*, is to ascertain the points of the compass on which objects lie.

BEATS. A term applied, in Music, to the beatings or pulsations resulting from the joint vibrations of two sounds of the same strength and nearly the same pitch; that is, of two sounds differing little, if at all, in intensity, and almost, but not exactly, in unison: when the unison is complete, no beats are heard.

BEGUIN'S SULPHURATED SPIRIT. A variety of hydrosulphate of ammonia, commonly called hepatized ammonia.

BE'LEMNITE (βέλεμνον, a dart). An extinct genus of the Cephalopods, allied to the sepia, and having a long, straight, and chambered conical shell, resembling a dart, in the interior of the body. They have been termed *lapides lyncis*, from an old idea that they came from the lynx; and, from their resemblance to fingers, *petrified fingers*, *devil's fingers*, *spectre candles*, &c.

BELLA'TRIX. A star of the second magnitude, the smaller of the two bright upper stars in Orion. It is marked γ by Bayer, and 24 by Flamstead.

BELL-METAL. An alloy of 100 parts of copper with 20 to 25 of tin.

BELL-METAL ORE. A designation

of the sulphuret of tin found in Cornwall, from the appearance of bronze or bell-metal which it possesses, in consequence of its containing copper pyrites.

BENGALEE YEAR. This appears to have been once identical with the Hegira; but the solar computation having subsequently been adopted, of which the years exceed those of the Hegira by 11 days, it has lost nearly 11 days every year, and is now about 9 years later, the year 1245 of the Hegira having commenced in July, 1829, and the Bengalee year 1236 having begun 13th April of the same year. The number 593 must be added to bring this to the Christian era.

BENZO'IC ACID. *Flowers of Benjamin.* An acid exhaled from benzoin, dragon's blood, and other resins, by heat.

BENZO'IN. *Asa dulcis.* A balsam which exudes from incisions made in the *Styrax Benzoin,* or Benjamin-tree.

BE'NZOYL. *Benzoïle* or *benzule* of several English chemical writers. The hypothetical radical of a series of compounds, including benzoic acid, from which it derives its name, and the essence or volatile oil of bitter almonds.

BE'RBERIN. A crystalline substance of a fine yellow colour, derived from the bark of the barberry root; used as a dye stuff.

BERG, or ICE BERG (*berg,* Swedish, mountain). A mountain of ice, met with in the Polar Seas. Flat sheets of wide-spread ice are called *fields;* and small portions, *floes,* from their being found floating.

BE'RGMEHL. Literally, *Mountain meal;* an earth, so named in Sweden, resembling fine flour, and celebrated for its nutritious qualities. It is found to be composed entirely of the shells of loricated animalcules, which having accumulated at the bottom of the waters in which the living animals are found, form a stratum of considerable thickness.

BE'RYL. A variety of the *emerald;* a mineral or gem, usually of a green colour of various shades, passing into honey-yellow and sky-blue. When coloured green by oxide of chromium, it forms the true emerald, and when colourless and transparent, *aqua marina.*

Chryso-bèryl (χρυσὸς, gold). One of the finest of the gems, consisting of glucina and alumina.

BE'TELGEUSE. A star of the first magnitude in the southern constellation Orion.

BE'ZOAR (*pâd-zahr,* Persian, a destroyer of poison). A morbid concretion formed in the bodies of land animals. Such are the *hog-bezoar,* found in the stomach of the wild boar in India; the *bovine bezoar,* found in the gall-bladder of the ox, common in Nepaul; the *camel-bezoar,* found in the gall-bladder of the camel, and much prized as a yellow paint by the Hindoos; and the *goat-bezoar,* produced from animals of the goat kind, capra gazella. The Greek term for this species of concretion is, *ægagropila,* literally, mountain-goat ball.

BI, BINUS (*bis,* twice). Two; a pair. Also a prefix of certain saline compounds, into which two proportions of acid enter for one of base, as bi-arseniate.

1. *Biarticulate.* Having two articuli, or joints, as applied to the antennæ, or to the abdomen of certain insects.

2. *Biauriculate.* Having two auricles of the heart, as the mammalia, birds, reptiles, and most bivalve mollusca.

3. *Bicarbonates.* Salts containing a double proportion of carbonic acid gas.

4. *Bicongregate.* Bigeminate, or arranged in two pairs, as the leaflets of mimosa unguis cati.

5. *Bicrenate.* Doubly crenate; when the crenate toothings of leaves are themselves crenate.

6. *Bidentate.* Two-toothed, as applied to the fruit or achenia of bidens.

7. *Biennial.* Enduring throughout two years and then perishing: as plants which bear only leaves the first year; leaves, flowers, and fruit the second year, and then die.

8. *Bifarious.* Arranged in two rows, not necessarily opposite to each other; in this particular, the term is differenced from *distichous.*

9. *Bifoliolate.* When two folioles or leaflets are developed at the same point at the end of the petiole, as in zygophyllum fabago. The term is synonymous with *conjugate.*

10. *Biforines.* Minute oval bodies found in the leaves of some araceous plants. When placed in water, they discharge innumerable spiculæ from each extremity, until they become entirely emptied.

11. *Bifurcate.* Twice-forked, as applied to the inflorescence of stellaria, and synonymous with *dichotomous.*

12. *Bijugous.* In two pairs, as applied to the leaflets of a pinnate leaf.

13. *Bilabiate.* Having two lips, as applied to a calyx which has its sepals

cohering into two parcels, or to a corolla which has its petals similarly disposed.

14. *Bilobate.* Two-lobed, as applied to the leaves of bauhinia, &c.

15. *Bilocular.* Having two loculi or cells, as applied to the anther, and to certain capsules in plants.

16. *Bimana.* Two-handed; a designation of the first order of the Mammalia, comprising the single species *man*, and characterized by the presence of *hands* (or feet with opposable thumbs) on the upper extremities only.

17. *Bimedial.* In geometry, when two lines commensurable only in power, as the diagonal and the side of a square, are joined together, the sum is irrational with respect to either of the two lines, and is called by Euclid a *bimedial.*

18. *Binate.* Growing in pairs; a term synonymous with *bifoliolate.*

19. *Binervate.* Two-nerved; as applied to the wings of insects which are supported by only two nerves.

20. *Binocular.* That which belongs or applies to both eyes, as applied to a telescope, by which the object may be viewed with both eyes at the same time.

21. *Binomial.* An algebraical quantity consisting of two terms, as $a + b$, or $2a - 3bx$. The *binomial theorem*, first announced by Newton, is a formula by which any binomial may be raised to any given power, without the ordinary process of involution.

22. *Biocellate.* Having two ocelli or eyelets, as applied to the wing of an insect when marked with two eye-like spots.

23. *Bipartite.* Parted in two, as applied to the segments of a leaf.

24. *Bipectinate.* When a part has two margins toothed like a pecten or comb.

25. *Bipeltate.* When an animal or a part has a defence like that of a double pelta or shield.

26. *Bipinnate.* When the leaflets of a pinnate leaf themselves become pinnate, as in fumaria officinalis.

27. *Bipupillate.* When an eye-like spot on the wing of a butterfly has two pupillæ or dots within it of different colours.

28. *Biquadratic.* In algebra, the power immediately succeeding the cube; that is, the square of the square, or the fourth power. A *biquadratic equation* is that in which the unknown quantity rises to the fourth, but not to a higher power.

29. *Biradiate.* Applied to a part which has two radii or rays.

30. *Biserial.* Arranged in two series, or rows; a term synonymous with *bifarious.*

31. *Biserrate.* Doubly sawed, as applied to the margins of leaves, when the serrations are themselves serrate.

32. *Bisetous.* When a part is furnished with two setæ or bristle-like appendages.

33. *Bisexual.* Applied to flowers which contain both stamen and pistil in the same envelope; a term synonymous with hermaphrodite.

34. *Bispinose.* When an animal or part is furnished with two spines.

35. *Bisulcate.* Applied to a foot which rests upon two sulci or hoofed digits.

36. *Biternate.* When three secondary petioles proceed from the common petiole, and each bears three leaflets, as in fumaria bulbosa.

37. *Bivalved.* Having two valves; applied to the shells of certain mollusca.

BIBLIO'GRAPHY (*βιβλίον*, a book, *γράφω*, to write). Among the ancients this term denoted the writing or the transcription of books. In modern times, it signifies the science of the knowledge of books, with reference to their authors, subjects, editions, and history.

BICE. A blue colour, prepared from the lapis armenius, for painting.

BILLION. In numeration, a million of millions, expressed by 1,000,000,000,000. By this term the French signify only a thousand millions.

BI'NARY COMPOUNDS. A series of chemical compounds, formed by the union of two elementary bodies with each other in their combining proportions only, or in multiples of them, and in no intermediate proportions. If the constituents of a binary compound be represented by A and B, the latter being the oxygen or electro-negative constituent, the most frequent combination is $A + B$, then $A+2B$, $A+3B$, and $A+5B$. The combination of $2A+3B$ is not unfrequent; but $2A+B$, $A+4B$, $A+7B$, $2A+2B$, or $2A+5B$ are of comparatively rare occurrence. The five compounds of nitrogen and oxygen afford a good illustration of this *law* of combination.

BI'NARY NOTATION. A kind of notation, proposed by Leibnitz, in which only two characters are used, 1 and 0, the zero having the power of multiplying the number it follows by two, as in the common notation it multiplies by ten. The number *one* is represented by 1; *two*, by 10; *three*, by 11; *four*, by 100; *five*, by 101; *six*, by 110; *seven*, by 111; *eight*, by 1000; *nine*, by 1001; *ten*, by 1010, &c.

BIO'GRAPHY (*βίος*, life, *γραφή*, writing). That department of literature which treats of the lives of individuals. It is thus distinguished from *history*, which treats of states and nations.

BIRD'S-EYE VIEW. A mode of *prone perspective* representation, by which objects are shown, in nature or in painting, below the spectator, who can see them only by looking down upon them. The reverse of this is the *supine perspective*, termed *di solto in su*, employed for ceiling-pieces, which the spectator can view only by looking upwards.

BIRDS' NESTS, ESCULENT. The nests of the *Hirundo esculenta*, a species of swallow peculiar to the Indian islands, formed of a viscid substance, not unlike isinglass. Nothing satisfactory is known as to the formation of these eatable nests.

BI'SMUTH (*wismuth*, German). A reddish-white metal, usually found in tin mines. It occurs as an oxide, under the name of *bismuth ochre;* as a sulphuret, called *bismuth glance;* as a sulphuret with copper, called *copper bismuth ore;* and with copper and lead, called *needle ore.* The subnitrate is known, in Pharmacy, under the name of *magistery* of bismuth. The sublimed oxide is known by the name of *flowers* of bismuth; the chloride as the *butter* of bismuth. An alloy of bismuth, lead, and tin, constitutes *Newton's fusible metal.*

BISSE'XTILE, or LEAP-YEAR. A term adopted in the Julian calendar. Julius Cæsar, having ascertained that the solar year consisted of $365\frac{1}{4}$ days, made the civil year 365 days, and added a sixth at the end of four years, to compensate for the quarter of a day dropped. This fourth year, which contained 366 days, was termed *bissextile*, from its doubling the 24th of February, or, according to the Roman way of reckoning, the *sextilis*, or *sixth* of the calends of March (*bissextus dies*). This arrangement was denominated the *Julian Style*, or the *Old Style*, as distinguished from the *Gregorian* or *New Style.*

BISTRE. A brown pigment, made from the roots of beech and other woods, reduced to soot, and then boiled and evaporated.

BITTER PRINCIPLE. A general term applied to an intensely bitter substance, procured by digesting nitric acid on silk, indigo, &c. The *bitter of Welter* is the former name of picric or carbazotic acid, formed by the action of nitric on anilic or indigotic acid.

BITTERN. The *mother water*, or uncrystallizable residue left after muriate of soda has been separated from sea-water by crystallization. It owes its bitterness to sulphate and muriate of magnesia. It contains bromine.

BI'TTERSPAR. *Rhombspar.* A crystalline mineral, bearing the same relation to dolomite and magnesian limestone, that calcareous spar does to common limestone.

BITU'MEN (*πίτυμα*, *πίτυς*, pine). A mineral pitch, supposed to be formed in the earth by the decomposition of animal and vegetable substances. In its most fluid state it constitutes *naphtha;* when of the consistence of oil, it becomes *petroleum;* at the next stage of induration it becomes *elastic bitumen;* then *maltha;* and so on until it becomes a compact mass, and is then called *asphaltum.*

BITU'MINOUS SHALE. An argillaceous shale, much impregnated with bitumen, which gives it a dark brown or blackish colour; its structure is slaty, the streak brown and shining.

BI'VALVE (*bis*, twice, *valvæ*, folding-doors). A shell which has two valves, belonging to the order *Dithyra.*

BLACK COMPOUNDS. 1. *Black lead*, or plumbago, is a carburet of iron, found in a pure state only at Borrowdale in Cumberland. It derives its name from its leaden appearance, for it does not contain a particle of lead. 2. *Black dye* is a compound of oxide of iron with gallic acid and tannin. 3. *Black flux* is a mixture of charcoal and carbonate of potash. 4. *Black chalk* is a mineral found in primitive mountains, and sometimes near coal formations. 5. *Black jack* is the technical term for blende or mock lead, an ore of zinc. 6. *Black wadd* is an ore of manganese, called the black oxide, and used as a drying ingredient in paints. 7. *Black turpeth* is the protoxide of mercury, commonly called the gray, ash, or black oxide. 8. *Lamp black* is a species of charcoal procured by burning resinous substances in a furnace. 9. *Spanish black* is also a charcoal made of burnt cork, and first used by the Spaniards. 10. *Black salts*, is the name given in America to *wood-ashes*, after they have been lixiviated, and the solution evaporated, until the mass has become black.

BLADDER GREEN. A green pigment, prepared from the ripe berries of the *Rhamnus catharticus*, or Buckthorn, mixed with gum arabic and lime water.

BLANCHING. *Etiolation.* The process of whitening the leaves and stems of plants, by excluding the light, and thus preventing the development of their natural properties.

BLANK VERSE. Verse without rhyme or the consonance of final syllables.

BLASTE'MA (βλαστάνω, to bud). A Greek term applied to the rudimental mass of an organ in the state of formation; it is said to consist of fluid, nucleated cells, and granules which spontaneously change into cells and into nuclei of cells. Botanical writers apply the term to the *thallus* of lichens; according to Mirbel, the blastema comprises the radicle, plumule, and caulicle of the embryo.

BLASTOCA'RPOUS (βλαστὸς, a shoot, καρπὸς, fruit). A term applied, in Botany, to those plants in which germination takes place within the fruit before it falls, as in the mangrove.

BLA'STUS (βλαστὸς, a shoot). A term sometimes applied to the plumule of grasses. With the same idea, Richard considers the scutelliform cotyledon of these plants to be a particular modification of the radicle, and calls it *hypoblastus;* the anterior occasional cotyledon he views as a peculiar appendage, and names it *epiblastus;* the radicle is a protuberance of the caulicle, and termed *radiculoda.* Finally, to embryos of this description he gives the general designation of *macropodal.* Dr. Lindley observes that in these ideas Richard was wrong, as is now well known.

BLA'TTIDÆ. A family of *Orthopterous* insects, named from the genus *blatta*, a familiar species of which is known under the vernacular term cockroach.

BLEACHING. The chemical process of *whitening* linen or woollen stuffs. 1. *Linen* is bleached, by the old process, by exposure to air and moisture; by the new process, by means of chlorine or solution of chloride of lime. 2. *Woollen stuffs* are bleached by soap and water, which is called the Natural Method; or by exposure to the vapour of sulphur, which is commonly called *bleaching by the flower*, or bleaching of Paris, because this method is employed in that city more than elsewhere.

BLEACHING POWDER. Chloride of lime, prepared by exposing hydrate of lime gradually to chlorine gas. This compound is obtained in solution by transmitting a stream of chlorine gas through hydrate of lime suspended in water, and the solution is then called *bleaching liquid*, or oxymuriatic alkaline water.

BLENDE. A term signifying a mineral which contains no ore, particularly applied to the native sulphuret of zinc, but extended by mineralogists to other substances, as manganese-blende, antimony-blende, ruby-blende, &c.

BLETTING. A term adapted by Dr. Lindley to denote that peculiar bruised appearance in some fruits, called *blessi* by the French, for which we have no equivalent English expression.

BLIGHT. A popular name for various diseases of plants. These diseases are probably owing to arrest of the natural functions of plants by circumstances depending on temperature and the conditions of the atmosphere.

BLO'EDITE. A massive translucent salt, found at Ischel in Upper Austria, together with prismatic gypsum.

BLOODSTONE. *Hæmatites.* A green agate coloured by chlorite, with numerous red spots like drops of blood; called also heliotrope and oriental jasper.

BLOW-PIPE. A small conical tube, bent at one end, so as to be easily introduced into the flame of a candle or lamp, for the purpose of directing a stream of flame, by *blowing* through it, upon any object which is to be heated.

Oxy-hydrogen Blow-pipe. An apparatus for producing intense heat, by supplying a stream of hydrogen with pure oxygen, so that the two gases issue together in the form of a jet from the nozzle of the blow-pipe.

BLUE COMPOUNDS. 1. *Prussian* or *Berlin blue* is the sesquiferricyanide of iron; *basic Prussian blue* is a compound of Prussian blue and peroxide of iron. 2. *Saxon blue* is a sulphate of indigo, or a solution of indigo in concentrated sulphuric acid. 3. *Blue verditer* is an impure carbonate of copper; *blue copper ore* is the finely crystallized subcarbonate of copper. 4. *Turnbull's blue* is the ferricyanide of iron, precipitated on adding red prussiate of potash to a protosalt of iron. 5. *Blue vitriol, copperas,* or blue stone, is the sulphate of copper, prepared by roasting and oxidating the sulphuret of copper. 6. *Blue John* is a technical name for fluor or Derbyshire spar. 7. *Blue black* is another name for ivory black.

BLUFFS. A term employed in the United States to designate high banks presenting a precipitous front to the sea or a river.

BODY. A term applied in Physics to any determinate part of matter, but of itself utterly passive, capable of any sort of motion, and of all figures and forms. *Body*, or *substance*, which is the same thing, is usually denoted by the general term *matter*. Its forms are the *solid*, as crystals; and the *fluid*, which are *elastic* and aëriform, as gases, or *inelastic* and liquid, as water. In Geometry, the term body is synonymous with *solid*.

BOG-EARTH. An earth composed of light siliceous sand and about 25 per cent. of vegetable fibre in a decomposing state.

BOG IRON ORE. A ferruginous deposit, occurring at the bottom of peat mosses and in marshy places, owing to the presence of oxide of iron in solution in almost all water. These ferruginous matters sometimes form, below the soil, a plate, or *pan*, which is impermeable to the roots of trees.

BOILING POINT. That degree in the scale of the thermometer, at which *ebullition* is produced under the medium pressure of the atmosphere. Thus, 212° is the boiling point of water, when the barometer stands at 30 inches; at 31 inches, it is 213·76; at 29, it is only 210·19; in a common vacuum, it is 70°.

BOLE (βῶλος, a mass). A friable earthy substance, a species of the soapstone family. It is found in Lemnos, and is hence termed *Lemnian earth;* also in Armenia, France, and other places. Its colours are yellow-red, and brownish-black, when it is called *mountain soap*.

BOLE'TIC ACID. An acid procured from the expressed juice of the *Boletus pseudo-igniarius*, a species of mushroom.

BOLO'GNIAN STONE. Native sulphate of barytes; a phosphoric stone found at Bologna. When heated with charcoal, it becomes a powerful *solar phosphorus*.

BOMBIC ACID (βόμβυξ, the silk-worm). An acid contained in a reservoir near the anus of the silk-worm. It forms salts with the alkalies, earths, and metallic oxides, which have been called *bombiates*.

BOMBY'CIDÆ (*bombyx*, the silk-worm). A tribe of *Lepidopterous* insects, named from the genus *Bombyx*, and consisting of Moths allied to the common silk-worm. The principal characteristics of the family are the presence of merely rudimentary maxillæ, remarkably small palpi, and bipectinated antennæ.

BOMBY'LIDÆ. A family of *Dipterous* insects, named from the genus *Bombylius*, and distinguished chiefly by their long proboscis.

BONE EARTH. The residue of bones which have been calcined, and converted into a friable substance, consisting chiefly of phosphate of lime.

BOO'TES. A northern constellation, containing fifty-four stars, the principal of which is Arcturus.

BORA'CIC ACID. An acid compound of boron and oxygen, formerly called *Homberg's sedative salt* and *sedative salt of borax*. It occurs native on the edges of hot springs in Florence, &c., in small pearly scales, and also in a massive state. It forms salts with bases, which are called *borates*, of which the only important one is borax.

BO'RACITE. A mineral consisting of an anhydrous compound of magnesia and boracic acid, in the extraordinary ratio of 3 equivalents of the former to 4 of the latter. The rare mineral *hydroboracite* is said to be a compound of a borate of lime and borate of magnesia, in both of which the acid and the base are in the same ratio as in boracite, with 18 equivalents of water.

BORAGINA'CEÆ. The Borage tribe of Dicotyledonous plants. Herbaceous plants or shrubs, with *leaves* alternate, covered with asperities; *corolla* gamopetalous; *stamens* inserted in the corolla; *fruit*, four nuts, distinct.

BORAX (*baurach*, Arab.). A native bi-borate of soda, chiefly found in an impure state, and then called *tinkal*, or *rough borax*, as a saline incrustation in the beds of certain small lakes in an upper province of Thibet. When the refined salt is deprived of its water of crystallization by fusion, it forms a vitreous transparent substance, called *glass of borax*.

BOREAL SIGNS. Those on the north side of the equinoctial; viz. Aries, Taurus, Gemini, Cancer, Leo, and Virgo.

BORNEEN. The name given to a compound of carbon and hydrogen found in valeric acid, supposed to be identical with liquid camphor.

BO'RON. An elementary substance, somewhat analogous to carbon, always found in combination with oxygen as boracic acid, from which it was first obtained by Davy by the action of the voltaic battery.

BO'RURET. A compound of the element boron with a metal.

BOTANY (βοτάνη, a plant). The science which treats of the Vegetable Kingdom. 1. *Structural Botany* relates to the laws of vegetable structure, internal or external, independently of the presence of a vital principle. 2. *Physiological Botany* relates to the functions of plants and their changes in disease or health. 3. *Descriptive Botany* relates to the description and nomenclature of plants. 4. *Systematic Botany* relates to the principles upon which plants are connected with, and distinguished from, one another.

I. SYSTEM OF LINNÆUS.

1. *Classes.*—Plants are distributed into twenty-four classes, founded on the number, position, and relative connexion of the *sexual organs.* Of these classes, the first twenty have *hermaphrodite* flowers; the following three, *unisexual* flowers; the last has no flowers. The first eleven classes are founded on the *number of the stamens;* the 12th and 13th, on their *number* and *position;* the 14th and 15th, on their *number* and *relative length;* the 16th, 17th, and 18th, on modes of *connexion* subsisting between the *filaments* of the stamens; the 19th, on *connexion* of the *anthers* of the stamens; the 20th, on *connexion* of the *stamens* with the *pistil;* the 21st, 22nd, and 23rd, on modifications arising from *unisexuality* and *hermaphroditism*; the 24th, on the absence, or obscure nature, of the sexual organs, as compared with those of all the other classes.

2. *Orders.*—The classes are distributed into orders, the first thirteen classes being divided, each, into several orders depending on the *number of the styles;* the 14th, into two orders, the seeds, in the one, being *covered* by a seed-vessel, those in the other being, as Linnæus erroneously supposed, *naked;* the 15th, into two orders, the one characterized by a long seed-vessel, or *siliqua,* the other by a short one, or *silicula;* the 16th, 17th, and 18th, into several orders founded on the *number of the stamens;* the 19th, into three orders relating to the *unisexual, hermaphrodite,* or *neutral* condition of the florets; the 20th, 21st, and 22nd, into several orders dependent on the *number* and modes of *connexion of the stamens;* the 23rd into three orders founded on *unisexuality* and *hermaphroditism;* the 24th, on general natural affinities. This and the preceding paragraph may be studied in connexion with the tables on the two following pages.

CLASSES OF THE LINNÆAN SYSTEM.

FLOWERS HERMAPHRODITE.

Class		
1.	MONANDRIA	1 *Stamen* in each flower.
2.	DIANDRIA	2 *Stamens* equal in length.
3.	TRIANDRIA	3 ,, ,,
4.	TETRANDRIA	4 ,, ,,
5.	PENTANDRIA	5 ,, ,,
6.	HEXANDRIA	6 ,, ,,
7.	HEPTANDRIA	7 ,, ,,
8.	OCTANDRIA	8 ,, ,,
9.	ENNEANDRIA	9 ,, ,,
10.	DECANDRIA	10 ,, ,,
11.	DODECANDRIA	12 to 19 ,,
12.	ICOSANDRIA	20 or more, on the *calyx.*
13.	POLYANDRIA	20 or more, on the *receptacle.*
14.	DIDYNAMIA	4; 2 long, 2 short.
15.	TETRADYNAMIA	6; 4 long, 2 short; *flowers cruciform.*
16.	MONADELPHIA	*Filaments* united at the base into one set.
17.	DIADELPHIA	*Filaments* united into two sets.
18.	POLYADELPHIA	*Filaments* united into three or more sets.
19.	SYNGENESIA	*Anthers* united. *Flowers compound.*
20.	GYNANDRIA	*Stamens* inserted on the *Pistil*

BOTANY.

CLASSES OF THE LINNÆAN SYSTEM (continued).

FLOWERS UNISEXUAL.

CLASS	
21. MONŒCIA	*Stamens* and *Pistils* in *separate flowers* on the *same plant.*
22. DIŒCIA	*Stamens* and *Pistils* in *separate flowers* on two *separate plants.*
23. POLYGAMIA	*Stamens* and *Pistils* *separate* in some flowers, *united* in others, either on the *same plant,* or on *two* or *three* distinct plants.
24. CRYPTOGAMIA	*Fructification* concealed.

ORDERS OF THE LINNÆAN SYSTEM.

1. The *Orders* of the first thirteen Classes are founded on the *number of styles*

1. *Monogynia,* 1 style.	6. *Hexagynia,* 6 styles.
2. *Digynia,* 2 styles.	7. *Heptagynia,* 7 styles.
3. *Trigynia,* 3 styles.	8. *Octogynia,* 8 styles.
4. *Tetragynia,* 4 styles.	9. *Decagynia,* 9 styles.
5. *Pentagynia,* 5 styles.	10. *Polygynia,* many styles.

2. The *Orders* of the fourteenth Class are two, founded on the presence or (supposed) absence of a seed-vessel:—
   1. *Gymnospermia,* seeds 4, apparently naked; or ovarium 4-lobed.
   2. *Angeiospermia,* seeds in a distinct seed-vessed.

3. The *Orders* of the fifteenth class are two, founded on the comparative length of the seed-vessel:—
   1. *Siliquosa,* seeds in a long seed-vessel, or siliqua.
   2. *Siliculosa,* seeds in a short seed-vessel, or silicula.

4. The *Orders* of the sixteenth, seventeenth, and eighteenth Classes are founded on the *number of stamens* in each adelphia, or brotherhood:—

1. *Triandria,* 3 stamens.	3. *Decandria,* 10 stamens.
2. *Pentandria,* 5 stamens.	4. *Polyandria,* many stamens.

5. The *Orders* of the nineteenth Class are founded on the structure of the flower:—
   1. *Æqualis,* all the florets perfect.
   2. *Superflua,* florets of the *disk* perfect; of the *ray,* pistilliferous only.
   3. *Frustranea,* florets of the *disk* perfect; those of the *ray* neuter.

6. The *Orders* of the twentieth Class are founded on the number of the stamens:—

   1. *Monandria,* 1 stamen. 2. *Diandria,* 2 stamens, &c.

7. The *Orders* of the twenty-first and twenty-second Classes are founded on the number, union, and situation of the stamens:—

   1. *Monandria,* 1 stamen. 2. *Diandria,* 2 stamens. 3. *Monadelphia,* &c.

8. The *Orders* of the twenty-third Class are three, founded on the separation of the sexes in the same plant, or in different plants:—
   1. *Monœcia,* unisexual flowers accompanied by barren or fertile flowers, or both, all on *one plant.*
   2. *Diœcia,* the same, on *two different plants.*
   3. *Triœcia,* the same, on *three different plants*

9. The *Orders* of the twenty-fourth Class are Natural orders, or Families:—

   1. *Filices.* 2. *Musci.* 3. *Hepaticæ.* 4. *Lichenes.* 5. *Fungi.* 6. *Algæ.*

BOTANY.

II. NATURAL SYSTEM.

Class I.—Exogens, or Dicotyledonous Flowering Plants.

Leaves reticulated. Stem with bark, wood, medullary rays, and pith; increasing in diameter by the addition of new matter to the exterior. Flowers with a quinary, or more rarely a quaternary, division. Seeds in a pericarp. Cotyledons two, opposite; or, if more, whorled, or on the same plane. Germination exorrhizous.

1. *Divisions of Jussieu.*—The primary divisions are founded on the separation, the combination, and the absence of the petals, and are termed the *polypetalous*, the *monopetalous*, and the *apetalous* groups; to which is added a fourth, founded on the separation of the sexes in flowers having no petals, and termed *diclinous*. The first three are divided with reference to the insertion of the stamens, which are epigynous, perigynous, or hypogynous; further, the monopetalous epigynous group is subdivided into plants which have their stamens united and those which have them distinct. Hence we have eleven classes:—

			Class.
Polypetalous	Stamens epigynous		1
	Stamens perigynous		2
	Stamens hypogynous		3
Monopetalous	Corolla hypogynous		4
	Corolla perigynous		5
	Corolla epigynous	Anthers united	6
		Anthers distinct	7
Apetalous ...	Stamens epigynous		8
	Stamens perigynous		9
	Stamens hypogynous		10
Diclinous			11

2. *Divisions of De Candolle.*—De Candolle reduced the eleven classes of Jussieu to four; the first three being founded on the separation or cohesion of the several parts of the flower, the fourth on the suppression of the floral envelopes. Thus, in Thalamifloræ, all the parts are present and distinct from each other; in Calycifloræ, the stamens adhere to the calyx; in Corollifloræ, the petals cohere with each other; in Monochlamydeæ, the corolla is suppressed, and, in the most imperfect orders, the calyx also.

Polypetalous	Stamens hypogynous	*Thalamifloræ.*
	Stamens perigynous	*Calycifloræ.*
Monopetalous		*Corollifloræ.*
Apetalous		*Monochlamydeæ.*

3. *Divisions of Dr. Lindley.*—Dr. Lindley first distributes the Class into the Polypetalous, Monopetalous, and Incomplete *sub-classes;* these are next divided into *groups.* The principles on which these divisions are founded are stated in the following table:—

Table of Groups.

Sub-class I. Polypetalæ.	Groups.
Albumen very considerably larger than the minute embryo	*Albuminosæ.*
Albumen absent, or only forming a layer between the embryo and the seed-coat.	
Ovary inferior (often with an epigynous disk)	*Epigynosæ.*
Ovary superior.	
Placentæ parietal	*Parietosæ.*
Placentæ in the axis.	
Calyx dislocated	*Calycosæ.*
Calyx complete; its parts being all on the same plane.	
Carpels united into a solid pistil, parallel with each other	*Syncarposæ.*
Carpels oblique, upon a gynobase	*Gynobaseosæ.*
Carpels disunited	*Apocarposæ.*

Sub-class II. Incompletæ, or Apetalæ.

Calyx altogether absent	*Achlamydosæ.*
Calyx present.	
Embryo curved round albumen	*Curvembryosæ.*
Embryo straight.	
Stamens monadelphous	*Columnosæ.*
Stamens distinct.	
Calyx tubular, often corolliform	*Tubiferosæ.*
Calyx very imperfect	*Rectembryosæ.*

Sub-class III. Monopetalæ.

Fruit consisting of but one perfect carpel	*Aggregosæ.*
Fruit of several carpels.	
Ovary inferior	*Epigynosæ.*
Ovary superior.	
Carpels three or more	*Polycarpopsæ.*
Carpels only two.	
Fruit nucamentaceous	*Nucamentosæ.*
Fruit capsular	*Dicarposæ.*

Class II.—Endogens, or Monocotyledonous Flowering Plants.

Leaves straight-veined. Stem increasing in diameter by the addition of new matter to the centre. Flowers with a ternary division. Embryo with one cotyledon. Germination endorrhizous.

Divisions of Dr. Lindley.—There are two primary divisions, one having the organization of the flowers *perfect, i. e.* with a distinct calyx and corolla, and a regular consolidated cotyledon; the other *imperfect*, the calyx and corolla being either entirely absent, or in an incomplete condition, and the cotyledon being commonly rolled up without consolidation, or actually flat. The former includes four *groups*, the latter two, the characters of which are stated in the following table:—

Perfect Endogens.

Group 1.—Epigynosæ. Anthers distinct. Flowers complete, formed upon a ternary plan. Ovary inferior; or, if superior, then the leaves either scurfy or equitant.

Zingiberaceæ. Musaceæ. Hæmodoraceæ. Taccaceæ. Bromeliaceæ Marantaceæ. Amaryllidaceæ. Burmanniaceæ. Iridaceæ. Hydrocharaceæ.

Group 2.—Gynandrosæ. Stamens and style consolidated into a central column. Flowers complete, formed upon a ternary plan. Ovary inferior, usually once-celled, with scobiform seeds.

Orchidaceæ. Vanillaceæ. Apostasiaceæ.

Group 3.—Hypogynosæ. Flowers coloured, formed upon a ternary plan. Ovary superior.

Palmaceæ. Melanthaceæ. Liliaceæ. Butomaceæ. Juncaceæ. Pontederaceæ. Gilliesiaceæ. Commelinaceæ. Alismaceæ. Philydraceæ.

Group 4.—Retosæ. Leaves either with many ribs, the intervals between which are irregularly netted, or with a midrib and netted sides; foot-stalk taper, articulated with the stem. Embryo without a lateral slit. Flowers never arranged in a spadix. Floral envelopes complete.

Smilaceæ. Dioscoreaceæ. Roxburghiaceæ.

Imperfect Endogens.

Group 5.—Spadicosæ. Flowers herbaceous or imperfect; the perianth sometimes absent. Embryo with a lateral slit for the emission of the plumule.

Pandanaceæ. Araceæ. Typhaceæ. Juncaginaceæ. Cyclanthaceæ. Acoraceæ. Naiadaceæ. Pistiaceæ.

Group 6.—Glumosæ. Bract scale-like, glumaceous, imbricated, in the room of a calyx.
Graminaceæ. Desvauxiaceæ.
Cyperaceæ. Restiaceæ. Xyridaceæ.

Class III.—Acrogens, Cryptogamic, or Flowerless Plants.

Plants usually composed of cellular tissue only. Stem, when such exists, increasing by extension of its point. Reproduction taking place either by spores inclosed in thecæ, or imbedded in the substance of the plant. Germination occurring at any part of the surface of the spore.

Sub-class 1.—Ætheogamous. Plants furnished with air-vessels and stomates.
Filices. Marsiliaceæ. Lycopodiaceæ.
Equisetaceæ. Salviniaceæ. Marchantiaceæ. Jungermanniaceæ.

Sub-class 2.—Amphigamous. Plants having neither air-vessels nor stomates.
Characeæ. Andræaceæ. Fungaceæ.
Musci. Lichenaceæ. Algaceæ.

BOTANY BAY RESIN. An aromatic resin which exudes from the trunk of the *Acarois resinifera* of New Holland.

BOTHRE'NCHYMA (*βόθρος*, a pit, *ἔγχυμα*, *enchyma*). A name recently applied in Botany to the *pitted tissue* or *dotted ducts* of former writers, the appearance of these tubes being occasioned by the presence of little pits sunk in their walls. It is either *articulated* or *continuous.*

BOTRY'LLARIÆ (*βότρυς*, a bunch of grapes). A group of the *tunicated* mollusca, in which the individuals consist of small ovoid bodies, which attach themselves to sea-weed or other substances in regular bunches, arranged like the rays of a star around a common centre.

BOTRY'LLI (*βότρυς*, a bunch of grapes). A little cluster of berry-shaped bodies.

BOTRYOÏ'DAL (*βότρυς*, a bunch of grapes, *εἶδος*, likeness). Clustered, like a bunch of grapes.

BO'TRYOLITE (*βότρυς*, a bunch of grapes, *λίθος*, a stone). A mineral occurring in botryoïdal masses, in a bed of gneiss near Arendahl in Norway, and considered by some writers as a variety of datholite. Its basis is boron.

BOULDERS. *Erratic Blocks.* A provincial term for large rounded blocks of stone lying on the surface of the ground, or sometimes imbedded in loose soil, different in composition from the rocks in their vicinity; hence it appears that they have been transported from a distance.

BOURGEON; BOUTON. Terms applied by French botanists to the *leaf-bud* and the *flower-bud*, respectively, of English writers.

BOUSTROPHE'DON (*βοῦς*, an ox, *στρέφω*, to turn). A term descriptive of a mode of writing alternately from left to right and from right to left, from its resemblance to the mode of making furrows in ploughing a field. Some specimens occur among the Arundelian marbles at Oxford.

BOVEY COAL. *Brown Coal.* A variety of coal found at Bovey Heathfield, near Exeter. It consists of wood penetrated with petroleum, sometimes containing pyrites, alum, and vitriol.

BO'VIDÆ (*bos*, *bovis*, an ox). The Ox tribe; a family of the *Ruminantia*, in which the horns are directed upwards and forwards, and increase by layers during life.

BOYLE'S FUMING LIQUOR. Hydro-sulphuret of ammonia, or volatile liver of sulphur. See *Fuming Liquor.*

BRA'CCATE (*bracca*, breeches). A term applied to the feet of birds when concealed by long feathers descending from the tibia.

BRACHELY'TRA (*βραχὺς*, short, *ἔλυτρον*, a wing-case). A family of the pentamerous *Coleoptera*, characterized by the presence of four palpi, and by the shortness of the wing-cases. The *staphylinus* is the only genus of the family.

BRA'CHIATE (*brachium*, an arm). A term applied in Botany to branches which diverge nearly at right angles from the stem.

BRACHIO'PODA (*βραχίων*, an arm, *ποὺς*, *ποδὸς*, a foot). A division of the *Mollusca*, so named by Cuvier from their having two long spiral arms placed on each side of the mouth, which in many species can be unrolled to a considerable length, and protruded to some distance, in search of aliment. See *Palliobranchiata.*

BRACHI′STOCHRONE (βράχιστος, shortest, χρόνος, time). The name given by Bernouilli to a particular curve, by which a body arrives at a given point in a *shorter time* than if it followed any other direction.

BRA′CHIUM. The arm. The second segment of the anterior extremity of the lower mammalia. The *brachia* of insects are the first pair of legs in the hexapods, the direction of which is usually towards the head.

BRACHY′PTEROUS (βραχὺς, short, πτερὸν, a wing). A term applied to birds whose folded wings do not reach the base of the tail.

BRACHYU′RA (βραχὺς, short, οὐρὰ, a tail). A family of *Decapods,* distinguished by the shortness of the tail, as in the common crab.

BRACT (*bractea,* a thin leaf or plate of any metal). A term applied to the *flower-leaf,* or that leaf from whose axil the flower-bud is developed. These are the leaves which composse the *involucrum* of the Compositæ, the *glumes* of Graminaceæ, the *spathe* of Araceæ, &c. But the term is extended to all those modifications of leaves which are found upon the inflorescence, and are situated between the true leaves and the calyx of the flower. These are termed by some writers *bracteolæ,* or *bractlets.*

BRA′NCA′S WHEEL. A machine contrived by Giovanni Branca, in 1629, for raising water, and other purposes. It consists of a wheel furnished with flat vanes around its circumference, like the boards of a paddle-wheel. Upon these vanes steam is propelled from a close vessel; a rotatory motion is thus produced, and communicated to appropriate machinery.

BRA′NCHIA (βράγχια). Gills, or respiratory organs which extract the oxygen from air contained in water.

BRANCHIO′PODA (βράγχια, gills, ποὺς, ποδὸς, a foot). A designation of those *Crustacea* which have the branchiæ attached to numerous pairs of similar feet. They possess mandibles and maxillæ, and are generally small, monoculous or binoculous animals, with a large carapace enveloping the whole body.

BRANCHIO′STEGI (βράγχια, gills, στέγω, to cover). A tribe of cartilaginous fishes, in which the gills are free and covered by a membrane, as in the sturgeon.

BRAND or BURN. A disease in plants by which their leaves and tender bark are partially destroyed, as if they had been *burned.*

BRASQUE. A term used by the French metallurgists to denote the lining of a crucible or a furnace with charcoal.

BRASS. An alloy consisting of three parts of copper and one of zinc.

BRAZIL CURRENT. A branch of the great *Equatorial Current,* separating from the equatorial at 8° S. lat., opposite Cape St. Augustin, running to the southwest along the shores of Brazil to the mouth of the Plata river, and traced to the Straits of Magalhaens and Le Maire. See *Guiana Current.*

BRAZIL WOOD. The wood of the *Cæsalpinia Braziliensis,* which yields a red colouring matter used by dyers.

BRAZILETTO. An inferior species of Brazil wood, brought from Jamaica. It is one of the cheapest and least esteemed of the red-dye woods.

BRE′CCIA. An Italian term signifying an *opening* or *breaking* in any substance, applied by mineralogists to those compound stones which consist of agglutinated fragments of considerable size. When the agglutinated parts are rounded, the stone is called *pudding-stone.* According to the nature of their component parts, breccias are called calcareous, silicious, &c.

BREEZE, SEA and LAND. Names given to winds of a very limited range, experienced on the coasts of tropical countries, and depending on local circumstances.

1. *Sea breeze.* From its low conducting power, the surface of the land is more quickly heated than the sea, so that soon after sunrise the expanded air over the former begins to ascend, and is replaced by the colder air from the sea, forming the sea breeze.

2. *Land breeze.* After sunset, the earth's heat, being diminished, is more quickly dissipated by radiation than that of the sea, and the air over the land becomes dense and flows outwards, displacing the air over the sea, and producing the land breeze.

BRENTI′DES. A family of *Coleopterous* insects, named from the genus *Brentus,* and belong to the section *Rhyncophora* and sub-section *Recticornes.*

BRE′VIPENNES (*brevis,* short, *penna,* a quill). Short-quilled; a designation of Cuvier's first family of the order *Grallæ*, of which the ostrich is the type.

BRE'ZILIN. The colouring matter of Brazil wood, obtained from several species of *Cæsalpinia.*

BRISTOL STONES or DIAMONDS. Small brilliant crystals of quartz found in the neighbourhood of Bristol.

BRITISH GUM. This is starch reduced to a gum-like state by great heat, and used by calico printers.

BRITTLENESS. A quality of certain bodies by which they admit of being easily broken, or separated into irregular fragments.

BRO'MAL. A colourless oily liquid, corresponding with chloral, and formed by adding bromine to alcohol.

BROMATO'LOGY (*βρῶμα*, food, *λόγος*, a description). A description or treatise of food.

BROMELIA'CEÆ. The Pine-apple tribe of Dicotyledonous plants, named from the genus bromelia, and chiefly interesting from their capability of existing in a hot dry air without contact with the earth. See *Air Plants.*

BRO'MINE (*βρῶμος*, a stench). A deep red-coloured fetid liquid, formerly called *muride;* an ingredient of sea-water, of several salt springs, of the ashes of sea-weeds, and of those of the *Janthina violacea*, and other animals. It combines with oxygen, and forms *bromic acid;* and with hydrogen, forming the *hydrobromic.*

BRO'MURET. A combination of the bromic acid with iodine, phosphorus, sulphur, &c.

BRONZE. An alloy of copper, 8 or 10 per cent of tin and other metals.

BRO'NZITE. A variety of diallage, of a metallic or *bronze* colour.

BROWN COAL. An imperfect kind of coal, termed also, from its ligneous structure, *bituminous wood.*

BROWN SPAR. *Pearl spar* or *siderocalcite.* A massive mineral, harder than calcareous spar, but yielding to the knife.

BRU'CIA. A substance procured from the bark and seeds of nux vomica, and from St. Ignatius's bean. It is said to be a compound of strychnia and resin, and not a peculiar alkaloïd.

BRUNO'LIC ACID. One of the particular products which have been isolated in the distillation of coal.

BRUNSWICK GREEN. An ammoniaco-muriate of copper, used for oil painting.

BRYOZO'A (*βρύον*, moss, *ζῶον*, an animal). A term applied by Ehrenberg to a class of highly-organized polyps, most of the species of which incrust other animals or bodies like moss. They have been recently designated by Dr. Arthur Farre, *ciliobrachiate polyps.* They are among the species ranged by Cuvier under the head of *tubular polyps.*

BU'CCAL (*bucca*, the mouth or cheeks). Belonging to the mouth.

BUCCINI'NÆ. Whelks; a sub-family of the *Muricidæ*, named from the genus *buccinum*, and including shells generally recognized by the abrupt termination of the base, which is deeply notched.

BUCE'RIDÆ. The Hornbills; a family of the *Insessores*, or Perching-birds, readily distinguished by the enormous size of their bills, which are enlarged into protuberances resembling horns. See *Conirostres.*

BUD, LEAF, and FLOWER. 1. A *leaf-bud* (bourgeon) is a young plant produced without the agency of sexes, and consisting of rudimentary leaves surrounding a growing vital point, which elongates upwards in the form of stem, and downwards in the form of root. 2. A *flower-bud* (bouton) consists also of rudimentary leaves surrounding a fixed vital point, which, when fully developed, assumes the form of floral envelopes, or sexual apparatus.

BUFO'IDÆ (*bufo*, a toad). The Toad tribe; one of the principal divisions of the Anoural order of Amphibious animals, which undergo a metamorphosis similar to that of the frogs, but, unlike these, are usually found at a distance from water. See *Ranidæ.*

BULB. A scaly leaf-bud, which developes roots from its base, and a stem from its centre. When the outer scales are thin, and cohere in the form of a thin envelope, as in the onion, this is the *tunicated bulb.* When the outer scales are distinct and fleshy, as in the lily, this is called the *naked bulb.* There can be no such thing as a *solid bulb.* See *Cormus.*

BU'LBLET. *Bulbille.* A bulb which separates spontaneously from the stem of a plant, as in lilium bulbiferum.

BULBOTU'BER. A short, roundish, underground stem, resembling a bulb. The term was applied by Ker to the *Cormus.*

BU'LLADÆ. A family of marine mollusca, belonging to the fourth order of Cuvier's *Gasteropods*, and named from the genus *bulla*.

BUPRE'STIDÆ. A family of Coleopterous insects, named from the genus *buprestis*, and belonging to the section Pentamera and sub-section Sternoxi of Latreille.

BURE'TTE. A French term applied to a chemical instrument for dividing a given portion of liquid into 100 or 1000 equal parts.

BURNING-GLASS. A glass lens which *refracts* the rays of the sun into a focus. The solar rays may also be brought to a focus by *reflection* from a concave mirror, which is then called a *burning mirror*.

BURNT-EAR. A disease in corn, in which the fructification of the plant is destroyed, and, as it were, *burned* up. By the French it is called *charbon*, by the Germans *brand*. The disease is produced, according to De Candolle, by a minute fungus, termed *uredo carbo*, which he distinguishes from the *uredo caries*, or the cause of *smut*.

BUTOMA'CEÆ. A natural order of Monocotyledonous plants, named from the *butomus umbellatus*. They are tripetaloïdeous, with several carpels, the entire lining of which is covered with seeds.

BUTTERS. A term formerly applied, in Pharmacy, to *butter-like* substances, as those of antimony, of bismuth, &c., meaning the *chlorides* of those metals. Precipitated sulphur was also called butter of sulphur. *Vegetable butters* is a term also applied to the concrete oil of certain plants, from its resemblance to butter produced from the milk of animals.

BUTTON. A technical term applied to the round mass of metal found at the bottom of the crucible after fusion, or in the cupel in the process of assaying.

BU'TYRIC ACID (*butyrum*, butter). An oily limpid liquid; one of the volatile acids of butter. By distillation it yields a substance called *butyrone*.

BU'TYRINE (*butyrum*, butter). A peculiar oleaginous matter, found in butter, combined with oleine and stearine, and a small quantity of butyric acid.

BYSSI'FERA (*byssus*, and *fero*, to bear). A family of acephalous mollusca, which are attached to foreign bodies by means of a byssus.

BY'SSOLITE (*βύσσος*, *byssus*, *λίθος*, a stone). A massive filamentous mineral, implanted like moss on certain stones, at the foot of Mont Blanc, and also near Oisans, on gneiss.

BY'SSUS (*βύσσος*, fine flax). A term applied to the silky filaments which project from the bivalve called Pinna, and hence applied to the analogous parts in other molluscous animals. In Cryptogamic botany, the term *byssus* has been given to all those filamentous plants which inhabit cellars and subterranean abodes, and are now ascertained to consist of fungaceous plants in an early state of growth.

C

CA'CHOLONG. A variety of quartz found on the borders of the river *Cach*, in Bucharia. In the Calmuc language, *cholong* is said to signify a stone.

CACODY'L (*κακώδης*, fetid). A limpid liquid, supposed by Berzelius to be the compound radical of a series of arsenical compounds, and named in reference to the repulsive odour of its oxide, *alcarsin*. *Cacodylic acid* is obtained by the oxidation of cacodyl and its oxide, and is synonymous with *alcargen*.

CACTÁ'CEÆ. The Indian-Fig tribe of Dicotyledonous plants. Succulent *shrubs*, usually without leaves and with spinous buds. *Sepals* and *petals* confounded; *stamens* indefinite; *ovary* inferior, 1-celled; *fruit* succulent, eaten under the name of Indian figs. All the species are considered to be American.

CA'DENCE (*cado*, to fall). The close of a passage in music, or the resolution of a dissonant into a consonant chord. Also, an extemporaneous addition made by the performer at the end of a piece of music.

The *perfect cadence* is composed of the chord of the dominant, or of the dominant seventh, followed by that of the tonic. The *imperfect cadence* consists of the chord of the tonic, followed by that of the dominant, but rarely occurs as a final close. The *interrupted* or *deceptive cadence* is formed by a chord quite foreign to that which was expected, thus evading the close, and deceiving expectation.

The *plagal cadence*, sometimes called an imperfect cadence, consists of the chord of the subdominant, followed by that of the tonic.

CADET, LIQUOR OF. *Alcarsin.* A liquid obtained by distilling acetate of potash and arsenious acid, and remarkable for its insupportable odour and spontaneous inflammability in air.

CA'DMIUM. A bluish-white metal found in several of the ores of zinc; so named from *cadmia fossilis*, a former name of the common ore of zinc.

CADU'CIBRA'NCHIATE (*caducus*, falling, *branchiæ*, gills). A division of Amphibious animals, which, though furnished in the early period of their existence with gills and lungs, eventually lose all traces of the former, as in the frog, the newt, &c.

CADU'COUS (*cado*, to fall). A term applied in Botany to parts which *fall* early, as the calyx of the poppy, the petals of the gum cistus, &c. Parts which continue on the plant long are termed *persistent.*

CÆ'CUM (*cæcus*, blind). A blind tube, or cul-de-sac; a tube which terminates in a closed end.

CÆ'SPITOSE (*cæspes*, a turf or sod). Growing in tufts; forming dense patches or tufts, as the young stems of many plants.

CÆSU'RA (*cædo*, to cut). A term denoting a *cutting*, equivalent to the Greek τομή, and applied by grammarians to the place in a verse where a word ends, and the voice pauses a little. 1. In a heroic or hexameter, the most common cæsura is the *penthemimeral*, which occurs after the fifth foot, as, "Tityre, tu patulæ," &c. 2. The *hephthemimeral* cæsura occurs after the seventh half-foot, as "Formosam resonare doces," &c. 3. The *bucolic* cæsura, used by the bucolic or pastoral poets, occurs after the fourth dactyl, as, "Ambo florentes ætatibus," &c. 4. The cæsura occurs also after the third trochee, after the second dactyl, and after the third dactyl, the last instance being somewhat rare. See *Incision.*

CA'FFEIC ACID. An acid discovered in coffee, containing the aroma of the roasted seed. *Caffein* is a neutral crystalline substance obtained from unroasted coffee.

CAIRNGORM. A species of quartz, so named from a mountain of that name in Scotland, where it was once plentiful. It is a variety of *rock crystal.*

CA'LAMINE (*calamus*, a reed). The impure carbonate of zinc; a pulverulent mineral, generally of a reddish colour.

CA'LAMITE. A light-green mineral found in serpentine with magnetic iron and calcareous spar, near Normark in Sweden.

CA'LAMUS. A reed; a term adopted by De Candolle for all fistular simple stems without articulations, as those of rushes.

CA'LATHIS; CALA'THIUM (κάλαθις, καλάθιον, a basket). Terms adopted by some continental botanists for the *capitulum* or *anthodium* of other writers, denoting the inflorescence of Compositæ.

CALC SINTER (*kalk*, lime, *sintern*, to drop). A German name for carbonate of lime, occurring in stalactitical forms by the infiltration of carbonated limewater through the crevices of the roofs of caverns.

CALÇAIRE GROSSIER. Coarse limestone; an extensive stratum, or rather series of strata, found in the Paris-Basin, belonging to the Eocene tertiary period.

CA'LCARATE (*calcar*, a spur). Spurred, having a spur or spur-like appendage, as the petals of *aquilegia.* The *calcar* is sometimes called *nectarotheca*, or honey-depository, though it rarely secretes honey.

CALCA'REOUS. The name of a class of earths, consisting of lime and carbonic acid, as chalk, marble, &c. 1. *Calcareous rock* is another term for limestone. 2. *Calcareous spar* is crystallized carbonate of lime; Iceland spar is one of its purest varieties. 3. *Calcareous grit* is a subdivision of the middle oolitic formation. 4. *Calcareous sandstone* is another subdivision of the same formation.

CA'LCES. Plural of *calx*, quicklime. A former name for *oxides*, from their earthy character, resembling lime. The calx of tin is now called the oxide of tin.

CALCINA'TION (*calx*, quicklime). A term formerly applied to express the oxidation of a metal effected by the action of the air: the oxide thus formed was denominated a *calx*, from its being earthy like lime. The term is now generally applied whenever any solid matter has been subjected to heat, so as to be convertible into a state of powder.

CA'LCIUM (*calx*, quicklime). A peculiar metal discovered by Davy, of which *lime* is the well-known oxide.

CALCTUFF. An alluvial formation

of carbonate of lime, probably deposited from calcareous springs.

CA'LCULUS. The Latin term for a pebble, used in former times for the purpose of *calculation*. Hence it is applied to any branch of *mathematics* which involves calculation; any, in fact, except pure geometry. The several branches are noticed under their specific names.

CA'LENDAR (καλέω, to call). *Kalendar*. A table of the days of the year, arranged to assist the distribution of time, and to indicate remarkable days connected with devotion or business. The term is derived from the Roman *Calends*, or the first day of the month, when the pontiffs *called* the people together, to apprise them of the days of festival in that month.

1. *Roman Calendar*. In the Roman Calendar, as said to have been introduced by Romulus, the year was divided into 10 months only, comprising altogether 304 days. The year of Romulus was, therefore, of 50 days' less duration than the lunar year, and of 61 days' less than the solar year; and its commencement of course did not correspond with any fixed season. Numa Pompilius corrected this calendar, by adding two months, Januarius and Februarius, which he placed before Mars.

2. *Julian Calendar*. In order to render the calendar still more correct, Julius Cæsar fixed the solar year at 365 days, 6 hours, comprising, as was supposed, the period from one vernal equinox to another. The six hours were set aside, and, at the end of four years, forming a day, the fourth year was made to consist of 366 days. The day thus added was called intercalary. See *Bissextile*.

3. *Gregorian Calendar*. The Julian Calendar was defective in this particular —that the solar year, consisting of 365 days, 5 hours, and 49 minutes, and not of 365 days, 6 hours, there was a difference, between the apparent year and the real year, of eleven minutes. This difference having amounted, in the year 1582, to ten entire days, Gregory XIII. ordained that the 5th of October in that year should be counted as the 15th, thus cutting off ten days from that year; and to prevent the recurrence of this error, it was further determined that the year beginning a century should not be bissextile, with the exception of that beginning each fourth century. This is the Gregorian or *New Style*, as distinguished from the Julian or *Old Style*.

CALI'BRE. A French term, signifying the *bore* of a cannon, and generally expressive of the diameter of any round substance, and, figuratively, of the mental capacities. The calibre of round bodies is measured by what are called *Callipers*, or calliper compasses, which are formed with curved legs, furnished with knobs instead of points.

CA'LICO-PRINTING. The art of dyeing cotton cloth, called *calico* from Calicut in India, with one or more colours, in certain parts, leaving the rest of the material in its original state.

CALI'PPIC PERIOD. In ancient chronology, a correction of the Metonic cycle of nineteen solar years, proposed by Calippus. At the end of four of these cycles, there is an excess of one day and six hours over the number of lunations. Calippus, therefore, proposed to quadruple the Metonic period, and deduct a day from the end of it by reducing the days of one of the months from 30 to 29.

CALLUS, or CALLOSITY. A term applied to the thickening of enamel upon a shell, resembling a tumour, as in the inner lip of the olives, and near the hinge of some bivalves.

CALO'RIC (*calor*, heat). An imaginary fluid, or condition diffused through all bodies. In chemical language, *caloric* is, properly, the matter producing the sensation of *heat*. The words, however, are often confounded, the term *heat* being employed for both the cause and the effect.

1. *Sensible* or *free* caloric is that which produces the sensation of heat, or affects the thermometer. *Insensible* or *latent* caloric is that portion which passes into bodies during a change of form, without elevating their temperature; as into ice at 32°, as it becomes water, and termed *caloric* of *fluidity;* or into water at 212°, as it passes into vapour, and termed *caloric of vaporization*.

2. *Specific caloric* is the relative proportion of caloric which any body retains without the effects being sensible; and the power of retention which a body possesses, is called its *capacity for caloric*. The specific caloric of water is 23 times as great as that of mercury; thus, if equal weights of the former at 40°, and of the latter at 160°, be mixed together, the resulting temperature is 45°.

CALORI'FIC RAYS. Those rays proceeding from the sun or any burning body, which impart the sensation and other effects of heat.

CALORI'METER (*calor*, heat, μέτρον, measure). An apparatus for measuring the capacity of bodies for heat by the *quantity of ice* which they are capable of melting. Rumford's *water calorimeter*, consisting of a vessel filled with water through which a spiral tube is conducted, is employed for ascertaining the specific heat of gases.

CALO'RIMOTOR, (*calor*, caloric, *moveo*, to move). An apparatus, constructed by Dr. Hare of Philadelphia, for evolving caloric.

CALY'BIO (καλύβιον, a little hut). A term by which Mirbel designates the fruit called *gland* or *nucule* by other writers. It is applied to the fruit of the oak, of the chestnut, of the hazel.

CALYCIFLO'RÆ (*calyx*, a flower-cup, *flos*, a flower). Plants which have their flowers furnished with both a calyx and a corolla, the latter consisting of distinct petals, and their stamens perigynous.

CALY'CULATE (*calyculus*, a little calyx). Having an involucrum of bracts exterior to the calyx, as in many of the compositæ.

CALY'PTRA (καλύπτω, to veil). Literally, a *veil* or *hood*. A term applied to a membranous covering, which envelopes parts of certain plants, as the spore-vessel of mosses, the stamens of eucalyptus, &c. Such parts are said to be *calyptrate*.

CALYPTRÆ'IDÆ. Chambered limpets; a family of gasteropods, named from the genus *Calyptræa*. Some of these occur in a fossil state in beds of the pliocene, miocene, and eocene periods.

CALYX (κάλυξ, a cup). The flower-cup, or external envelope of the floral apparatus. See *Sepal*.

CA'MBIUM. A viscid juice abounding in spring between the bark and wood of trees, and supposed to be closely connected with the developement of woody fibre.

CA'MBRIAN GROUP. A Welsh group of rocks, constituting the upper of the clay-slate series, and comprising the Snowdon Rock, the Bala Limestone, and the Plinlimmon Rocks.

CAME'LIDÆ. The Camel tribe; a family of the *Ruminantia*, including the camels of the Old World, and the lamas of the New. By some naturalists they are referred to the horse tribe of the Pachydermata.

CAME'LOPARDÆ. A family of the *Ruminantia*, including only the giraffes, and characterized by the shortness and permanence of the horns, which are covered by a skin.

CAME'LOPA'RDALUS. The Camelopard; a modern northern constellation, consisting of fifty-eight stars.

CA'MERA OBSCURA. An instrument consisting, as the term denotes, of a *darkened chamber*, into which the rays of light, from an illuminated object, are admitted by means of a small aperture; these rays are received upon a white screen, and thus the object is distinctly seen in an inverted position. The instrument is constructed on the principle that light is propagated in right lines.

Camera lucida. This term denotes a *lightened chamber*, though no chamber is employed. The contrivance is founded on the fact, that when light is attempted to be thrown from a denser into a rarer medium at more than a certain angle, depending on the two media, no light will pass through, but all will be reflected. The principle is the same as that of the camera obscura, viz. that of throwing images of external objects upon a plane or curved surface, for the purpose of drawing or amusement.

CAMPANULA'CEÆ (*campanula*, a little bell). The Campanula tribe of Dicotyledonous plants. Herbaceous plants or under-shrubs, yielding a milky juice. *Corolla* gamopetalous, inserted into the top of the calyx, and withering on the fruit. *Stamens* inserted into the calyx, alternate with the lobes of the corolla. *Ovary* inferior, with two or more cells. *Fruit* dry, crowned by the withered calyx and corolla, and dehiscing by apertures or valves.

CAMPA'NULATE (*campanula*, a little bell). Bell-shaped; a term applied in Botany to the calyx and the corolla, when shaped like a little bell.

CA'MPHINE. A spirit for burning in lamps, said to consist of oil of turpentine with a species of naphtha.

CA'MPHOGEN. A colourless liquid procured by distilling camphor with anhydrous phosphoric acid.

CA'MPHORIC ACID. An acid procured by digesting camphor in nitric acid. *Campholic acid* has the consistence of camphor, but contains two parts more of hydrogen and oxygen.

CA'MPHRONE. A light oil procured by placing Camphor in contact with red-hot quicklime.

CAMPYLO'TROPOUS (καμπύλος, curved, τρέπω, to turn). A term applied to the ovule of plants, when its axis, instead of remaining rectilinear, is curved down upon itself, the base of the nucleus still continuing to be contiguous to the hilum.

CAMWOOD. A red dye-wood, principally obtained from Sierra Leone, and used with alum and tartar as a mordaunt.

CANAL. A groove observed in different parts of certain spiral shells, belonging to the *Zoophaga*, or carnivorous tribe, and adapted for the protrusion of the long cylindrical siphon possessed by these animals. This part, also, constitutes the base of the shell.

Besides this there is, in many of the mitres, *strombi*, and other predaceous genera, another canal or groove, placed in the interior of the *upper* part of the aperture, the use of which has not been ascertained.

CANALI'CULATE (*canaliculus*, a little canal). Channelled; long and concave, as the leaves of tradescantia.

CANCE'LLATE (*cancelli*, lattice-work). Latticed; any thing which is cross-barred, or marked by lines which cross each other at right angles; the character of a leaf which has veins without connecting parenchyma, anastomosing and forming a kind of net-work, as in hydrogeton fenestralis.

CA'NCER. The Crab; the fourth of the zodiacal constellations, consisting of 83 stars. It denotes the first month of winter, extending from the 20th of December to the 20th of January, and bears allusion to the retrograde motion of the sun at the winter solstice.

CANES VENA'TICI. Asterion and Chara, the Greyhounds; a modern northern constellation, consisting of twenty-five stars.

CANI'CULAR PERIOD (*canicula*, the dog-star). A period of forty days, comprising, according to the old calendars, twenty before and twenty after the heliacal rising of the *Canicula*, Sirius, or dog-star. The time of the heliacal rising of the dog-star, however, varies in consequence of the precession of the equinoxes, so that, instead of happening in the warmest season, it has gradually advanced towards the autumn. In modern almanacs, therefore, the period of the rising of the star has been disregarded, and the *canicular days* are reckoned as commencing on the third of July, and ending on the eleventh of August.

CA'NIDÆ (*canis*, a dog). The Dog tribe; a family of carnivorous Vertebrata, which, like the felidæ, are digitigrade, but have no retractile claws, and they are further characterized by the presence of two flat tuberculated molar teeth behind the great incisor.

CANIS MAJOR. The Greater Dog; a southern constellation, consisting of thirty-one stars, the principal of which is Sirius.

Canis Minor. The Lesser Dog; a southern constellation, consisting of fourteen stars, the principal of which is Procyon.

CANNEL COAL. A bituminous substance, which yields, on combustion, a bright flame without smoke. The term is probably a vulgarism for *candle coal*, in allusion to its illuminating properties. It occurs in most of the English collieries, especially at Wigan in Lancashire.

CANNON METAL. An alloy of copper, tin, and small quantities of other metals, used for casting cannon.

CANO'PUS. A star of the first magnitude, in the rudder of the southern constellation Argo.

CANTATRI'CES (*canto*, to sing). Songsters; an order of Birds, so named by Macgillivray on account of their being pre-eminently musical, as the orioles, thrushes, chanters, &c. They are all of small size, with the bill slender, and adapted for seizing insects, worms, or soft fruits. They thus differ from the Vagatrices, which have the bill more elongated and stronger; and from the Deglubitrices, in which it is short, stout, and conical.

CANTON'S PHOSPHORUS. A substance made by exposing calcined oyster-shells and sulphur to a red heat. On exposure to light, it acquires the property of shining in the dark.

CAOU'TCHOUC. *India Rubber*. An elastic resin or dried juice of certain trees growing in South America and the East Indies. *Caoutchine* is a liquid procured by the distillation of caoutchouc.

CAPACITY FOR HEAT. The power which a body possesses of retaining a certain proportion of latent heat. See *Caloric, Specific*.

CAPE (*caput*, a head). A headland, or projecting portion of a coast. It sometimes terminates in an acute angle, and is then called a *point*. If the projecting portion is small or low, the affix *ness* is employed in England, as in such terms as Dungeness; and in Scotland that of *mull*, as the mull of Galloway.

CAPE'LLA or α AURI'GÆ. The She-Goat, a star of the first magnitude in the body of the goat, which Auriga is represented as carrying. This is a double star, with a small proper motion.

CAPILLAME'NTUM (*capillus*, a hair). A term applied by some botanical writers to the *filament*, or that part of the stamen which supports the anther.

CAPILLARY TUBE (*capillus*, a hair). A minute *hair-like* tube, so small as to be less than the twentieth of an inch in diameter inside, used for experiments in illustrating capillary attraction. See *Attraction, Capillary.*

CAPILLI'TIUM (*capillus*, a hair). Literally, the hair of the head; a kind of purse or net, in which the sporules of some fungi are retained, as in trichia.

CA'PITATE (*caput, capitis*, the head). A term applied to any part of a body which is terminated by a knob, like the head of a pin; or to certain hairs in plants which terminate in a glandular enlargement.

CAPI'TULUM (dim. of *caput*, a head). A little head; a form of inflorescence, in which numerous flowers are placed on a depressed axis, as in Compositæ. It is also termed *anthodium*, calathium, &c.

CA'PNOMOR (καπνὸς, smoke, μοῖρα, part). A colourless transparent liquid, found among the products of the distillation of wood. Its name is derived from its being one of the ingredients of smoke.

CAPPARIDA'CEÆ. The Caper tribe of Dicotyledonous plants. Herbaceous plants, shrubs, or trees; *leaves* alternate; *sepals* 4, *petals* 4, cruciate; *stamens* definite or indefinite; *ovary* stalked; *fruit* 1-celled. The flower-buds of Capparis spinosa are the *Capers* of shops.

CA'PRIC and CAPRO'IC ACIDS. Volatile odoriferous compounds, yielded by butter on its conversion into soap.

CAPRICO'RNUS. The Goat; the tenth of the zodiacal constellations, consisting of fifty-one stars. The first month of summer, extending from the 20th of June to about the 20th of July. Capricorn opens and begins the year; he is the leader of the celestial animals, as on earth he is the leader of the flock.

CA'PRIDÆ (*caper*, a goat). The Goat tribe; a family of the *Ruminantia*, in which the horns are directed upwards and backwards, and their bony core is partly cellular. It includes only the goats and sheep.

CAPRIFICA'TION (*caprificus*, the wild fig-tree). The process of fertilizing the fig, as practised in the Levant. At the ripening period, branches of the wild fig are placed upon the cultivated plants; an insect, the *cynips psenes*, brought with the wild plant, pierces the fruit, and accelerates its maturation.

CA'PRIFOLIA'CEÆ. The Honeysuckle tribe of Dicotyledonous plants. Shrubs or herbaceous plants with *leaves* opposite; *flowers* corymbose, monopetalous; *stamens* alternating with the lobes of the corolla; *ovarium* inferior, many-celled; *fruit* indehiscent.

CAPRIMU'LGIDÆ (*caprimulgus*, the goat-sucker). The Goat-suckers; a family of the *Insessores*, or Perching birds, remarkable for their nocturnal habits, light and rapid flight, and great activity (see *Fissirostres*). By Macgillivray, these birds are placed in a group, belonging to an order which he names *Volitatrices*, or Gliders.

CA'PSTAN. A modification of the wheel and axle, used on board of ships. It consists of an axle placed upright, with a head or drum, pierced with holes for the levers. The *weight* is drawn by a rope passing two or three times round the axle, to prevent its slipping. The *capstan* is, in fact, a *wheel and axle*, of which the wheel turns horizontally; when the wheel turns vertically, the machine is called a *windlass.*

CA'PSULA (dim. of *capsa*, a chest). A capsule or little chest; a term applied in botany to a dry, superior fruit, dehiscent by valves, and always proceeding from a compound ovarium. By some writers, the term *capsella* is applied to the same kind of fruit, if small and one-seeded.

CARA'BIDÆ (*carabus*, a beetle). A family of the pentamerous *Coleoptera*, consisting of a numerous tribe of Beetles, characterized by the presence of six palpi, and by the hooked termination of their claws. They are aquatic, or terrestrial; most of them are carnivorous.

CA'RADOC SANDSTONE. A division of the Lower Silurian Rocks, consisting of red, purple, green, and white, micaceous, sometimes quartzose grits, and limestones, 2500 feet thick, containing corals and mollusca.

CARBAZO'TIC ACID. *Nitro-picric* acid. An acid formed by the action of nitric acid on indigo, and named from the terms *carbon* and *azote.*

CARBON (*carbo*, a coal). A substance well known under the form of coal, charcoal, lamp-black, &c. In chemical language, it denotes the pure inflammable principle of charcoal; in its state of absolute purity, it constitutes the *diamond.*

1. *Carbon Vapour.* The name of a *hypothetical* substance, for carbon has never been obtained in the insulated form of vapour. When the term is used in chemical works, it denotes the *condition of carbon as it exists in carbonic acid.*

2. *Carbon, Animal.* Animal charcoal, bone charcoal, and ivory black, are names applied to bones calcined, or converted into charcoal, in a close vessel.

3. *Carbon, Mineral.* A term applied to charcoal, with various proportions of earth and iron, without bitumen. It has a silky lustre, and the fibrous texture of wood. It occurs stratified with various kinds of coal.

4. *Carbonic Acid.* A pungent and acidulous gas, often issuing naturally from the ground in volcanic countries, and produced by the combustion of charcoal in oxygen gas. It was termed by Black *fixed air*, from its having been found to exist, in a fixed state, in limestone. It is the gas produced by the vinous fermentation.

5. *Carbonates.* Compounds of carbonic acid with the salifiable bases. They are composed either of one atom of acid and one of the base, or of two of acid and one of the base; the former are called *carbonates*, the latter *bi-carbonates.*

6. *Carboniferous.* A term usually applied, in a technical sense, to an ancient group of secondary strata. But any bed containing coal may be termed carboniferous. See *Coal Formation.*

7. *Carbonization.* The union of carbon and iron. To *decarbonize* cast-iron or steel, is to drive off its carbon in the form of carbonic acid gas.

8. *Carburets.* Combinations of carbon with some metals by fusion; thus, steel is a carburet of iron. The term has also been applied to a peculiar compound of sulphur and hydrogen, the *carburet of sulphur*, also termed sulphuret of carbon, and alcohol of sulphur.

9. *Carburetted Hydrogen.* A colourless inflammable gas, abundantly formed in nature in stagnant pools, wherever vegetables are undergoing the process of putrefaction; it also forms the greater part of the gas obtained from coal. This gas was formerly called *heavy inflammable air.* See *Olefiant Gas.*

CA'RBUNCLE. A precious stone of the ruby kind, of a very rich, glowing, blood-red colour. Ure says it is probably the *alamandine*, a variety of noble garnet.

CA'RCERULE (*carcer*, a prison). *Dieresilis.* A term applied by Mirbel to a species of compound fruit, which is many-celled, superior; the cells are dry, indehiscent, few-seeded, and cohere by a common style round a common axis. It occurs in the tropæolum, the mallow, the lime, &c. See *Cœnobio.*

CARDIA'CEÆ. The Cockle tribe; an order of the conchiferous Mollusca, named from the genus *cardia;* in these the mantle is not only closed, but extended at the respiratory apertures into tubes of greater or less length. The foot is very strong.

CA'RDINAL (*cardo*, a hinge). An epithet implying *importance*, being suggestive of the hinge or pivot, on which every thing else depends. Thus, it denotes the north, south, east, and west points of the compass; the zodiacal signs Aries, Cancer, Libra, and Capricorn, &c.

CARI'NA. Literally, a keel, and hence applied to the two lower petals of a papilionaceous corolla, which cohere by their lower margin in the form of a keel, to the glumes of grasses, &c. By Link, the combination is expressed by the term *scaphium.*

CA'RINTHINE. A sub-species of the mineral augite, found in Carinthia, in a bed in primitive rock, associated with quartz, Kyanite, garnet, and zoisite.

CARMINE. A beautiful red pigment, obtained from cochineal.

CARNE'LIAN (*caro, carnis*, flesh). A variety of agate, presenting in some cases a flesh colour; its colour is uniform; it is never figured or striped, like other varieties of agate.

CARNEOUS *or* CARNOSE (*carnosus*, fleshy). Of a fleshy consistence, as applied to succulent leaves, &c.

CARNI'VORA (*caro, carnis*, flesh, *voro*, to devour). A group of mammiferous animals, constituting the typical order of that great division of the class which subsist on animal food. These are the *carnassiers* of Cuvier.

CARNO'SA (*carnosus*, fleshy). Fleshy animals, an order of polyps, including the sea-anemone, &c.

CARPEL (καρπὸς, fruit). A technical term, applied in Botany to a leaf in a particular state of modification, constituting the *pistil.* The blade of the leaf forms the ovary; the elongated midrib, the style; and the apex of the midrib, the stigma. The edge of the carpel, which corresponds to the midrib of the leaf, constitutes the *dorsal suture;* that of the united margins, the *ventral.* See *Pistil.*

CARPO'LOGY (καρπὸς, fruit, λόγος, description). That branch of botany which treats of the structure of fruits.

CARTESIAN DIVER. A well-known glass figure, constructed so as to float in a vessel of water above whose level a small portion of air is confined in such a manner that if this air be compressed, the figure will immediately descend, and rise again to the surface, when the pressure ceases to be exerted.

CARTE'SIAN PHILOSOPHY. A system of mystical and pantheistic philosophy introduced by René des Cartes. According to him, consciousness is the ground of all knowledge, and constitutes the essence of the soul; its objects or ideas are of three kinds—acquired, compounded, and innate. All physical phenomena are referred to *vortices*, or motions of matter, excited by the Author of all things. Des Cartes was born in 1596, and was contemporary with Lord Bacon.

CA'RTHAMIN. A beautiful red pigment, also called *carthamic acid*, procured from the flowers of the Carthamus tinctorius or Bastard Saffron, and used in silk dyeing.

CARU'NCLE (*caruncula*, dim. of *caro*, flesh). A little piece of flesh; a soft wart-like eminence; an irregular protuberance of the testa about the umbilicus of certain seeds.

CARYOPHYLLA'CEÆ. The Chickweed tribe of Dicotyledonous plants. Herbaceous plants, with *leaves* opposite, and tumid nodes; *flowers* polypetalous, symmetrical; *stamens* definite; *ovarium* one-celled, with a free central placenta, *fruit* a one-celled capsule, by obliteration of the dissepiments.

Caryophyllaceous Corolla. A corolla, the petals of which have long, narrow, and distant claws, as distinguished from the *alsinaceous* corolla, in which the petals are short and distant.

CARYO'PSIS (κάρυον, a nut, ὄψις, likeness). A one-celled, one-seeded, superior, dry, indehiscent fruit, with the integuments of the seed cohering inseparably with the endocarp; the characteristic fruit of the Graminaceæ.

CASE (*casus*, a falling). This word is used by grammarians, in its strict sense, to signify a certain "variation in the writing and utterance of a noun, denoting the relation in which it stands to some other part of the sentence." But it is sometimes used to denote *that relation itself*, whether indicated by the termination, or by a preposition, or by its collocation. Much confusion has arisen from this ambiguity of the term. *Whately.*

CASE-HARDENING. The process of converting the external part of iron into a coating of steel, by cementation for a limited time.

CA'SEIC ACID (*caseus*, cheese). An acid extracted from cheese, and supposed to contain many of the properties of this substance. *Casein* or *caseum* is the curd of the coagulable portion of milk, a principle analogous to albumen. *Caseous oxide* is another name for aposepedine, a substance procured by the putrefaction of animal matter.

CASSI'DEOUS (*cassis*, a helmet). Helmet-shaped; a designation of the irregular *corolla* of aconitum and other plants, in which one petal is very large and hooded, or *helmet-shaped.*

CA'SSINÆ. Helmet-shells; a subfamily of the *Muricidæ*, named from the typical genus *cassis*, and characterized by their large and often gigantic size.

CAST IRON. A very variable mixture of reduced substances, of which the principal is iron combined with carbon. The fused metal is run into channels formed in sand, and thus cast into ingots or pigs. *White cast iron*, which is the most definite variety, consists of four atoms of iron and one atom of carbon.

CASTOR or α GEMINORUM. A star of the first magnitude in the head of the Twins, being the nearer of the two to the pole.

CA'STORIDÆ (*castor*, the beaver). The Beaver tribe; a family of the *Rodentia*, comprising the beavers, voles, lemmings, &c., and containing many genera which closely resemble the rats.

CAT'S EYE. A mineral, of a beautiful appearance, brought from Ceylon. Its colours are grey, green, brown, red, of various shades. From a peculiar play of light, arising from white fibres interspersed, the name has been derived: the French call the appearance *chatoyant.*

CA'TACLYSM (κατακλυσμὸς, a flood). A term applied by geologists to a deluge or inundation.

CATALOGUE OF THE STARS. A table of the fixed stars, arranged according to their right ascensions, or longitudes, with their declinations, or latitudes, together with their annual variations and magnitudes.

CATA'LYSIS (κατὰ, downwards, λύω, to loosen). Decomposition by contact.

A body in which the *catalytic force* resides, resolves others into new compounds, merely by contact with them, or by an *action of presence*, as it has been termed, without gaining or losing any thing itself. The body which determines changes in another is called the *catalytic agent:* yeast resolves sugar, by contact, into carbonic acid and alcohol.

CATEGOREMA'TIC (*κατηγόρημα*, a predicate). A logical designation of a word which is capable of being employed by itself as a term or predicate of a proposition. Adverbs, prepositions, &c., and also nouns in any other case besides the nominative, are *syncategorematic*, i. e. can only form part of a term.

CATEGO'RICAL (*κατηγορικὸς*, categorical, as opposed to hypothetical). A logical term, applied to a proposition, which affirms or denies a predicate of a subject absolutely, and without any hypothesis. See *Proposition*.

CA'TEGORIES (*κατηγορία*, a head of predicables). Categories or predicaments are certain general heads, employed by logicians, to one or more of which every term may be referred. The categories enumerated by Aristotle are, *οὐσία, πόσον, ποῖυν, πρός τι, ποῦ, πότε, κεῖσθαι, ἔχειν, ποιεῖν, πάσχειν*; which are usually rendered in English by substance, quantity, quality, relation, place, time, situation, possession, action, suffering. They may all be ultimately referred to the two heads of *substance* and *attribute*, or, in the language of some logicians, *accident*.

CATE'NARY (*catena*, a chain). The curve described by a rope or chain which hangs when supported at both ends. All catenaries are similar curves.

CA'TKIN. The vernacular name of a mode of inflorescence, termed by the old writers *catulus*, *iulus*, and *nucamentum*. See *Amentum*.

CATO'PTRICS (*κάτοπτρον*, a mirror). That branch of the science of Optics which treats of the *reflection of light*. See *Optics*.

CAUCA'SIAN RACE. One of the five principal races of mankind, to which the nations of Europe and some of the western Asiatics belong. In this class the head is almost round, and of the most symmetrical shape; the cheek-bones without any projection; the face oval; and the features moderately prominent.

CAU'DATE (*cauda*, a tail). Tail-pointed; excessively acuminated, so that the point is long and weak, like the tail of an animal.

CAU'DEX. The trunk of a tree. In Botany, the stem, or ascending axis of growth, is termed *caudex ascendens;* the root, or descending axis, *caudex descendens*. The rhizome of Iridaceæ and epiphytous Orchidaceæ is often called *caudex repens*.

CAU'LICULE (*cauliculus*, a little stalk). By this term some botanists distinguish the *neck* of the embryo in plants from the *plumule* or *gemmule*. Mirbel comprises, under the general term *blastema*, the radicle, the plumule, and the caulicule. The term *cauliculi* is also applied to those small stems, which proceed from buds formed at the neck of a plant, without the previous production of a leaf.

CAU'LINE (*caulis*, a stem). Belonging to the stem, as applied to leaves which grow from the stem, as distinguished from *radical* or root leaves.

CAU'LIS. The Latin term for a *stem*, but applied in botany to the ascending caudex of herbaceous plants or shrubs. In trees, the main stem is sometimes called *caulis arboreus*, but more commonly the *trunk*. The *caulis excurrens* is a stem which rises vertically from the earth, and bears branches on its sides; the *caulis deliquescens*, a stem which at a certain distance from the earth throws out irregular ramifications. The stem of grasses is called the *culmus* or straw; that of rushes, the *calamus* or reed. Plants which have no distinct stem, are called *acaulescent*.

CAULOCA'RPOUS (*καυλὸς*, a stem, *καρπὸς*, fruit). A term applied in botanical glossology to those polycarpous plants, whose stem endures many years, constantly bearing flowers and fruits; as trees and shrubs. See *Rhizocarpous*.

CAU'STIC CURVE (*καυστικὸς*, burning). In transcendental geometry, a curve to which the rays of light, reflected or refracted by another curve, are tangents. It is termed *caustic*, owing to the accumulation of heat from the collection of the rays of light along the curve. Caustic curves are of two kinds; *catacaustics*, or those formed by reflection, and *diacaustics*, or those formed by refraction.

CAUSTI'CITY (*καίω*, *καύσω*, to burn). That property of certain substances, as the pure alkalis, concentrated acids, and metallic salts, by which they combine so powerfully with organized bodies as to destroy their texture.

CA'VERNOUS TEXTURE. A term applied, in geology, to that texture of aggregated compound rocks, which is characterized by the presence of numerous small cavities, of a roundish, oval, or other form, as in lava.

CA'VIDÆ. The Guinea-pig tribe; a family of the *Rodentia*, containing the largest-sized animals of the order, indigenous in tropical America, where they replace the hares and rabbits of cold climates.

CAVITA'RIA (*cavitas*, a cavity). Intestinal worms, or Entozoa, which have an intestinal canal floating in a distinct abdominal cavity.

CAWK. A technical term applied to opaque sulphate of baryta, or vitriolated heavy spar.

CE'BRIONITES. A family of Coleopterous insects, of the section Malacoderma of Latreille, named from the genus *cebrio*.

CE'DRIRET. A substance found among the products of the distillation of wood.

CE'LAPRAXITE'LLIS. A modern southern constellation, consisting of sixteen stars.

CE'LESTINE (*cœlum*, the sky). Sulphate of strontian, so named from its frequently presenting a blue colour.

CELLA'RIADÆ. The second family of the Polypiaria membranacea of Blainville, named from the genus *cellaria*, and consisting of hydriform animals, distinct from one another, contained in membranous cellules with a bilateral opening, and comprising the flustra, lunulites, &c.

CE'LLULAR TISSUE (*cellula*, a little cell). The elastic connecting tissue of the various parts of animal and vegetable bodies, consisting of cellules or vesicles of various figures, adhering together in masses.

CELLULA'RES (*cellula*, a little cell). Cellular plants; those which consist, in many cases, entirely of cells, and have no flowers or spiral vessels. They are also called cryptogamous and acotyledonous plants. See *Vasculares*.

CEMENT. A preparation made of various materials, which is applied in a soft state, and afterwards hardens and unites the surfaces to which it is applied.

Roman Cement. A mortar made of lime, and puzzolano ground to fine powder. The latter substance consists principally of pumice, found near Pozzuoli.

CEMENTATION. A process by which the properties of a body are changed, on being surrounded with the powder of other bodies, and exposed to a high temperature, as the conversion of iron into steel, by cementation with charcoal. The substance so employed is called *cement powder*.

CENTAURUS. The Centaur; a southern constellation, consisting of thirty-five stars.

CENTRAL ECLIPSES. A term applied to *annular* eclipses, because the centres of the sun and of the moon appear to coincide.

CENTRAL FORCES. The forces which cause a moving body to tend towards, or recede from, the centre of motion.

CENTRAL MOTION. A curvilinear motion round that point of a body which is called the *centre of gravity*, resulting from the balance of the centripetal and the centrifugal or tangential forces.

CENTRI'FUGAL FORCE (*centrum*, a centre, *fugio*, to avoid). The force by which all bodies, when set in motion round a centre, tend to move uniformly in a straight line, and thus to *fly from the centre*, in a tangent to the circle in which they move.

Centrifugal Evolution. Leaving the centre; a term applied to inflorescences, in which the central flowers open first.

CENTRI'PETAL FORCE (*centrum*, a centre, *peto*, to seek). The force or gravity by which a body tends towards some point as a centre: in obedience to this law all the planets are *drawn to the centre* of their respective orbits, and all bodies tend towards the centre of the earth.

Centripetal Evolution. Approaching the centre; a term applied to inflorescences, in which the marginal flowers open first.

CEPHALA'NTHIUM (κεφαλὴ, the head, ἄνθος, a flower). A head of flowers; a designation of the inflorescence of Compositæ, more commonly called a *capitulum* or anthodium.

CE'PHALOTHO'RAX (κεφαλὴ, the head, θώραξ, the thorax). The anterior division of the body in spiders, scorpions, &c., which consists of the head and chest blended together, answering to the first two segments of insects in a confluent state.

CEPHALO'PODA (κεφαλὴ, the head, ποὺς, ποδὸς, a foot). A group of molluscous invertebrate animals, in which the *head* is situated between the *trunk* and the *feet*, or principal organs of locomotion, as in the cuttle-fish.

CE'PHEUS. A northern constellation, consisting of thirty-five stars, the principal of which is Alderamin.

CERAMBY'CIDÆ. A family of Coleopterous insects, of the section Longicornis of Latreille, named from the genus *cerambyx*, and chiefly characterized by the great length of the antennæ.

CE'RASIN (*cerasus*, the cherry). A gummy substance, procured from the cherry and the plum-tree, which swells in cold water, but does not readily dissolve in it.

CERA'TIUM (κεράτιον, a little horn). A compound fruit, which is one-celled, many-seeded, superior, linear, dehiscent by two valves separating from the replum, and differing from the siliqua in the lobes of the stigma being *alternate* with the placenta, instead of opposite. It has been termed capsula siliquiformis. It occurs in glaucium, the *horned* poppy, &c.

CE'RCÆ (κέρκος, a tail). The feelers which project from the hind part of the body in some insects.

CERCA'RIÆ (κέρκος, a tail). A designation of those animalcules whose body is terminated by a tail-like appendage.

CERCO'PIDÆ. A family of the trimerous *Homoptera*, remarkable for their grotesque forms, and represented in this country by the cuckoo-spits and the frog-hoppers, so named from the frothy secretion which covers them in their larva and pupa states.

CE'REBRIC ACID (*cerebrum*, the brain). A peculiar acid found in the substance of the brain, containing phosphorus.

CERES. A telescopic planet, situated in the solar system, between Mars and Jupiter. It revolves round the sun in about 4½ years, and is about 264,000,000 of miles distant from it. It was discovered on Jan. 1st, 1801, by M. Piazzi, whose name it sometimes bears.

CE'RIC ACID (*cera*, wax). An acid produced by the action of the fixed alkalies on wax.

CE'RIN (*cera*, wax). 1. That constituent of common wax which dissolves in alcohol. 2. A peculiar substance procured by the action of alcohol on grated cork. 3. A variety of *allanite*.

CE'RITE. A rare mineral, consisting of the siliciferous oxide of cerium.

CERI'THINÆ. The Club-shells; a sub-family of the *Strombidæ*, or Wing-shells, named from the typical genus *Cerithium*, and characterized by their clavate form; the spire is very long; the outer lip considerably dilated; the base either truncate, or forming a short recurved channel.

CE'RIUM. A white metal found in two Swedish minerals called *cerite* and *cerine*, and more recently in *allanite*, at Alluk, in East Greenland.

CE'RNUOUS (*cernuus*, hanging down the head). Drooping; inclining from the perpendicular towards the horizon; a term applied to flowers.

CERTHI'ADÆ (*certhia*, the tree-creeper). A family of the *Insessores*, or Perching birds, consisting of the Tree-creepers, Nuthatches, &c., which resemble the Melliphagidæ, or Honey-suckers, in general structure. See *Tenuirostres*. According to Macgillivray these birds constitute a family of the *Reptatrices*, or Creepers, characterized by having the three fore toes more or less united at the base and spreading little.

CE'RULIN (*cæruleus*, blue). The name given to indigo in the modified state which it acquires during solution.

CE'RUSE. Carbonate of lead, occurring naturally in the form of carbonate of barytes. Under the name of *white lead*, it is employed by painters to give *body* to their colours.

CERVI'COBRANCHIA'TA (*cervix*, the neck, βράγχια, gills). The name of an order of Gasteropods, comprising, according to Blainville's arrangement, the patellæ or limpets, and three other genera. The order is subdivided into the *retifera* and the *branchifera;* the former are the patellæ, which he supposes to respire by means of a net-work belonging to the cavity which is above their head.

CE'RVIDÆ (*cervus*, a stag). The Stag tribe; a family of the *Ruminantia*, in which the antlers are periodically cast off.

CESTOI'DEA (κεστὸς, a girdle, εἶδος, form). Tape-worms; an order of the *Entozoa*, which have a long, depressed, flat, tape-like, articulated form, each segment having distinct nutritive and generative organs.

CETA'CEA (*cete*, a whale). An order of vertebrated mammiferous animals inhabiting the ocean, as the whale, the dolphin, &c. These animals resemble fishes in shape, but they breathe air, have warm blood, and a double circulation, like other mammalia; the tail-fin is also horizontal, and not vertical, as in true fishes.

CETIC ACID (*cete*, a whale). An acid procured from spermaceti, consisting of margarine and fatty matter. *Cetine* is a white laminated substance, constituting pure spermaceti.

CETONIA'DÆ. A family of Coleopterous insects, of the section Melitophili of Latreille, named from the genus *cetonia*, of which the common rose beetle affords a good example, and presenting one of the most extensive as well as the most brilliant of the beetle tribes.

CETUS. The Whale; a southern constellation, containing ninety-seven stars, the principal of which is Menkar.

CETYL. The supposed radical of a series of compounds derived from spermaceti.

CEVA'DIC ACID. *Sabadillic acid.* A crystalline fatty acid, obtained by saponification of the oil of cebadilla, or the seeds of the *Asagræa officinalis.*

CEY'LANITE. A mineral found in Ceylon, termed by Haüy, pleonaste.

CHA'BASITE. A mineral found in the fissures of some trap rocks, and in the hollows of certain *geodes* disseminated in the same rocks.

CHAFF OF RECEPTACLE. A term popularly applied to the paleæ, or the membranous, colourless bracts, placed between the florets upon the receptacle of Compositæ.

CHALA'ZA (χάλαζα, a small swelling). A small brown spot observed at the apex of some seeds, as of the Orange, formed by the union of certain vessels proceeding from the hilum.

CHALCE'DONY. A silicious simple mineral, uncrystallized, entering into the composition of agates, and found at Chalcedon in Bithynia. It is of a uniform milky white or pale yellow colour, often with a wavy internal structure, and a peculiar mammillary surface.

CHALCI'DIDÆ. A family of Hymenopterous insects, of the section Pupivora of Latreille, named from the genus *chalcis*, and characterized by minuteness of size, brilliancy of colours, and the general absence of nervures from the wings.

CHALK. Carbonate of lime. In Geology, a rock which forms the higher part of the cretaceous group.

CHALYBEATE WATERS. *Ferruginous waters.* Mineral waters, whose predominating or active principle is iron. There are two kinds: the *carbonated*, containing carbonate of the protoxide of iron; and the *sulphated*, containing sulphate of iron. Some of the latter contain sulphate of alumina, and are called *aluminous sulphated chalybeates.*

CHAMA'CEÆ. Clamp-shells; an order of the conchiferous Mollusca, named from the *chama;* in these, the mantle is closed, with the exception of three apertures, two of which are for the ingress and egress of water, and the third for the passage of the foot, which is here usually more powerful.

CHAMÆ'LEON. A modern southern constellation, consisting of ten stars.

CHAMÆ'LEO'NIDÆ. The Chameleon tribe; a family of Saurian reptiles, characterized by their extraordinary length of tongue, and by the adaptation of their feet and tail for climbing.

CHAMBERED. Divided internally into chambers or compartments, as the testaceous cephalopods, or the nautilus.

CHAMELEON MINERAL. A combination of black oxide of manganese and potash, which gives a green colour to water, passes gradually through all the shades of the prism, and at last becomes colourless.

CHA'MIDÆ. A family of macrotrachian Bivalves, named from the typical genus *chama;* in these animals the length of the siphons, which characterizes the tribe, is much reduced.

CHARA'CEÆ. A small family of cryptogamous plants, consisting of the two genera *chara* and *nitella.* These are submerged aquatic plants, interesting to the physiologist, as displaying the special circulation, or *cyclosis*, in vegetables.

CHARADRI'ADÆ (*charadrius*, the plover). The Plover tribe; a family of the *Grallatores*, or Wading birds, in which the bill is of moderate size, and the hinder toe either entirely deficient, or not long enough to reach the ground.

CHARCOAL. The residue of animal, vegetable, and many mineral substances, when heated to redness in close vessels.

CHARLES'S WAIN. Seven conspicuous stars in Ursa Major or the Great Bear.

CHART (*charta*, paper). A geographical or nautical representation of a portion of the earth's surface on paper, according to a scale which regulates the relative proportion of the parts. Geographical charts, being of a general character, are commonly called *maps;* but nautical or marine charts are particularly devoted to delineations of a coast and part of the adjacent sea.

Marine charts are constructed in two ways. 1. A *plane chart* represents the meridians, as well as the latitudes, by equidistant and parallel straight lines; and, consequently, the longitudes and latitudes appear equal, differing from the fact. 2. A *Mercator's chart* represents the meridians as well as the circles of latitude by parallel straight lines; but the distances of the latter increase in a determinate ratio from the equator to the poles.

CHEILO'GNATHA (*χεῖλος*, a lip, *γνάθος*, a jaw). An order of Myriapods or Centipedes, in which the two mandibles and the tongue are united to form a large lower lip.

CHEILO'PODA (*χεῖλος*, a lip, *πoὺς*, *ποδὸς*, a foot). A family of insects, of the class *Myriapoda*, or Centipedes, in which the lower lip is formed by a pair of feet.

CHEIRO'PTERA (*χεὶρ*, a hand, *πτερὸν*, a wing). An order of mammiferous quadrupeds, which have their extremities connected together by a wing-like expansion of the integuments, for the purpose of flight, as in the bat.

CHELE' (*χήλη*). A claw; particularly applied to the bifid claw of the crustacea, the scorpion, &c.

CHELI'CERA (*χήλη*, a claw, *κέρας*, a horn). The prehensile claws of the scorpion, which are the homologues of antennæ.

CHELIOSO'MIDÆ. A tribe of bivalved mollusca, which have a cartilaginous covering, analogous to that of the chitons and the tortoises.

CHELO'NIA (*χελώνη*, a turtle). An order of Reptiles, which have their ribs immoveable, comprising the tortoises, the turtles, &c. The body of these animals is enclosed in a shell, the upper and arched portion of which is termed the *carapace;* the lower plate is called the *plastron.*

CHELO'NIDÆ (*χελώνη*, a turtle). The Turtles; a family of Chelonian reptiles, distinguished by the incompleteness of their shelly covering, and by the peculiar modification of the feet for swimming.

CHEMICAL ATTRACTION. *Elective attraction* or *affinity*. These terms denote the action by which the particles of one class of bodies, when presented to those of certain other classes, unite to form new compounds, making a choice, or election, of those with which they unite.

CHEMICAL COMBINATION. An intimate union of two or more substances, which forms a compound differing in one or more of its essential qualities from those of its constituent bodies.

CHEMISTRY. A term, of Arabic origin, signifying the knowledge of the composition of bodies, and of the changes of constitution produced by their mutual action on each other.

CHENOPODIA'CEÆ. The Goosefoot tribe of Dicotyledonous plants, comprising beet, mangel wurzel, spinach, &c. Herbaceous plants or undershrubs, with *leaves* alternate; *flowers* small; *stamens* inserted into the base of the calyx; *ovary* superior; *fruit* membranous.

CHERT. A silicious mineral, nearly allied to chalcedony and flint, but less homogeneous and simple in texture. A gradual transition from chert to limestone is not uncommon.

CHIAROSCU'RO (*chiaro*, light, *oscuro*, dark). In painting, the judicious arrangement and combination of light and shade, and of bright and dark colours.

CHIA'STOLITE. A mineral found imbedded in clay-slate, resembling steatite. *Chiastolite-state*, or rather clay-slate, is a division of the Cumbrian group of rocks; it is dark-coloured, and generally soft, containing crystals of the mineral chiastolite.

CHI'LDRENITE. A mineral found in Devonshire, consisting of a phosphate of alumina and iron.

CHINA-CLAY. *Kaolin.* A variety of clay prepared from decaying granite.

CHINA GLAZE. A preparation for printing blue frit, made from ten parts of glass, two parts of lead, and three or more of blue calx.

CHINCHI'LLIDÆ. The chinchilla tribe; a small family of the *Rodentia*, indigenous in South America, and valuable in commerce for their furry skins.

CHI'TINE (*χιτὼν*, a tunic). A principle discovered in beetles and other insects, also called *entomoline*, and consisting of the base of their external skeleton.

CHITO'NIDÆ. A family of Gasteropods, named from the genus *Chiton*, and characterized by the presence of a protecting tunic-like shell, formed of many portions, which are often in contact and overlap one another.

CHLORATES. The salts of chloric acid, formerly called *hyper-oxymuriates.* The principal are those of potash and baryta.

CHLORIMETRY. The process of estimating the bleaching power of chloride of lime, by the quantity of a solution of sulphate of indigo which a known weight of chloride can discolour or render yellow.

CHLORINE (χλωρὸς, green). A greenish gas, obtained by the action of muriatic acid on peroxide of manganese. It was first described under the name of *dephlogisticated marine acid*, and was afterwards called *oxy-muriatic acid*. Its compounds, which are not acid, are called *chlorides* (or *chlorurets*), and are characterized by the same prefixes as the oxides.

CHLORITE (χλωρὸς, green). A friable mineral, of a green colour, allied in characters to talc and mica. It occurs dispersed in rocks, or forms beds of itself. The species are chlorite earth, common chlorite, chlorite slate, and foliated chlorite.

CHLORI'TIC SAND (χλωρὸς, green). Sand coloured green by an admixture of the simple mineral chlorite.

CHLOROCARBONIC ACID GAS. An acid termed by Davy *phosgene gas*, consisting of chlorine and carbonic acid.

CHLO'ROPAL. A silicate of iron, a mineral found associated with copal; its varieties are the conchoidal and the earthy.

CHLO'ROPHANE (χλωρὸς, green, φαίνω, to shine). A variety of *fluor spar*, which gives out an emerald green light by the mere heat of the hand.

CHLOROPHŒ'ITE. A green mineral found imbedded in basalt or in black indurated ironstone.

CHLO'ROPHYLLE (χλωρὸς, green, φύλλον, a leaf). The green colouring matter of leaves. See *Chromule*.

CHLOROUS POLE. A term founded on the theory that the particles of matter are susceptible of polarity. Hence that pole of a particle of zinc or of hydrochloric acid, which has the attraction or affinity which is characteristic of chlorine, or *chlorous attraction*, is called the chlorous pole. See *Zincous pole*.

CHOKE DAMP. The name given by miners to carbonic acid gas, which is apt to be formed and to accumulate in coal-mines.

CHO'NDROPTERY'GII (χόνδρος, cartilage, πτέρυξ, a fin). Cartilaginous fishes; one of the primary divisions of the class *Pisces*, so named from their skeleton containing little calcareous matter, and this disposed, not in fibres or plates, as in Osseous fishes, but in small granules. There are two orders of these fishes, viz. those with *free gills*, as the sturgeons, and those with *fixed gills*, in which the external edge of the gills is attached to the skin, as the sharks, rays, and lampreys.

CHORD OF AN ARC (*chorda arcûs*, the string of a bow). The straight line which joins the two extremities of a curve or arc. To find the chord of a given arc, find the angle subtending the arc; then, to find the chord of the angle, multiply the diameter by the sine of half the angle.

CHORD IN MUSIC. A combination of three or more harmonious sounds. 1. The *perfect chord* consists of any given note combined with a major 3rd and a perfect 5th; this and its inversions are called *consonant* chords. 2. The *chord of the seventh*, or dominant seventh, consists of any given note, combined with a major 3rd, a perfect 5th, and a minor 7th; this and its inversions are called *dissonant* chords.

CHOROGRAPHY (χώρα, a country, γράφω, to describe). The description of countries; a term differing from geography, as a part differs from the whole.

CHREMATI'STICS (χρήματα, wealth). The name given by continental writers to that branch of political economy which relates to the *wealth* of nations.

CHROMA'TIC SCALE (χρῶμα, colour). The scale of semitones employed in music. The term *chromatic* either denotes that the musical characters were written in colours, or suggests the variety of shades which, figuratively, characterize this scale. By *chromatic music* is usually meant that in which extreme intervals are used.

CHROMA'TICS (χρῶμα, colour). That branch of optics which treats of the colours of light, their several properties, and the laws by which they are separated.

CHROME ALUM. A term applied to a crystallizable double salt, consisting of sulphate of chromium. This salt is isomorphous with alum, and analogous to it in constitution, but the alumina is replaced by oxide of chromium.

CHROME IRON. Chromate of iron; one of the ores containing chromium; it occurs massive and crystallized.

CHROME YELLOW. A well-known pigment, consisting of chromate of lead.

CHRO'MIUM (χρῶμα, colour). A metal found in a Siberian mineral, called chromate of lead, or red lead, and named from its remarkable tendency to form coloured compounds. It combines with oxygen and forms *chromic acid*, the saline compounds of which are called *chromates*.

CHRO'MULE (χρῶμα, colour). The name of the colouring matter of plants. It has been also termed *chlorophylle;* but as the latter term merely expresses the greenness of leaves, it is inapplicable to the variously coloured granules found in vegetable tissue.

CHRONO'LOGY (χρόνος, time, λόγος, description). The arrangement of historical events according to the order of time. Dates are to History, what the latitude and longitude are to Navigation, fixing the exact position of the object to which they are applied.

CHRONO'METER (χρόνος, time, μέτρον, measure). A time-keeper; an instrument used for determining the longitude at sea, and for the purpose of measuring accurately small periods of time. It differs from a common watch in having a detached escapement, and a compensation for heat and cold.

CHRY'SALIS (χρυσὸς, gold). A fanciful name for the nymph or *pupa* state of insect life, from the glittering spots of golden hue with which the animal is sometimes speckled.

CHRY'SENE. A substance found among the products of the distillation of wood.

CHRYSI'DIDÆ. A family of Hymenopterous insects, of the section Pupivora, named from the genus *chrysis*, and remarkable for their brilliant colours. Some of them are termed *ruby-tail flies.*

CHRYSOBA'LANACEÆ. The Cocoa-plum tribe of Dicotyledonous plants, nearly allied to Rosaceæ, from which they differ in having a style proceeding from the very base of the ovary, and irregular stamens and petals. The fruit of *Chrysobalanus Icaco* is eaten, in the West Indies, under the name of cocoa-plum.

CHRY'SOBERYL. A green gem, consisting of glucina and alumina, occurring, massive and crystallized, in North America and Brazil. It is the *cymophane* of Haüy.

CHRY'SOLITE. A precious stone brought from the Levant, termed *peridot* by Haüy. Ure says that chrysolite is the topaz of the ancients, while our topaz is their chrysolite. A variety called, from its colour *olivine,* occurs in basalt in Germany. *Chusite* is said to be another variety of this gem.

CHRY'SOPRASE. A rare apple-green chalcedony, found in Silesia, which owes its colour to the presence of nickel.

CICA'DIDÆ (*cicada,* a cricket). The Cricket tribe; a family of the trimerous *Homoptera,* characterized by their power of producing a shrill, continuous sound, by means of a peculiar apparatus situated beneath the abdomen.

CICA'TRICULE (*cicatrix,* a scar). A little scar; the scar formed by the separation of a leaf from its stem. A stem so marked, is said to be scarred or *cicatrized.*

CICHORACEÆ. A division of the Compositæ, in which the florets are all ligulate, the juice usually milky, bitter, astringent, and narcotic, as in cichorium or succory, endive, and some species of lettuce.

CICINDE'LIDÆ. A family of Coleopterous insects, named from the typical genus *cicindela,* and distinguished by the presence of six palpi, and by their deriving their subsistence on the land.

CI'LIA (*cilium,* an eye-lash). A term used to designate a peculiar sort of moving organs, resembling microscopic hairs. The terms *ciliary motion* and *vibratile motion* have been employed to express the appearance produced by the moving cilia. Any part is said to be *ciliated* which is fringed with hairs, as the margin of some leaves.

CILIOBRA'CHIATE (*cilia,* vibratile hairs, *brachium,* the arm). A term applied by Dr. Arthur Farre to those polyps, whose arms are covered with cilia, forming important agents in securing prey. These are the *bryozoa* of Ehrenberg, and are ranged among the *tubular polyps* of Cuvier.

CILIO'GRADA (*cilia,* vibratile hairs, *gradior,* to advance). A group of the *Acalephæ,* in which the organs of motion consist of vibratile cilia disposed upon the surface of the body, which in their motions and office resemble those of the polygastric animalcules.

CIMI'CIDÆ. A family of Hemipterous insects, named from the "familiar beast" *cimex,* or the bug.

CI'MOLITE. *Cimolian earth.* A hydrous silicate of alumina, found in the island of Cimola, used for the same purposes as fuller's earth.

CINCHONA'CEÆ. The Cinchona tribe of dicotyledonous plants. Trees or shrubs with *leaves* opposite; *flowers* in panicles; *stamens* arising from the corolla; *fruit* inferior, either splitting into two cocci or indehiscent.

CINE'NCHYMA (*κινέω*, to move, *ἔγχυμα*, infusion). A botanical term applied to the laticiferous tissue in plants, distinguished by its irregular branching and anastomozing character.

CI'NGULUM. Literally, *a girdle.* In Zoology, the neck of a tooth. The term *cingula* denotes the transverse series of bony pieces connected by flexible joints, as in the armour of the armadillo.

CI'NNABAR. Sulphuret of mercury; the common ore of mercury, sometimes occurring crystallized as a beautiful vermilion.

CINNAMON STONE. A silicate of lime, alumina, and oxide of iron, brought from Ceylon, and named from its colour.

CI'NNAMYL. The hypothetical radical of the essence of cinnamon and of *cinnamic acid*—an acid formed by the oxidation of the essence of cinnamon in air.

CINNY'RIDÆ. The Sun-birds; a family of the *Insessores*, or Perchers, named from the genus *cinnyris*, closely allied to the Trochilidæ, or Humming-birds, which they represent in the Eastern Continent. See *Tenuirostres.*

CI'PHER (*sifr*, Arabic). A term signifying *empty*, and used as a substantive to denote the figure 0.

CI'POLIN. A green marble with white zones, brought from Rome.

CI'RCINATE (*circino*, to make a circle). Rolled inwards, or spirally downwards, from the point to the base, as the æstivation of certain plants, the development of the young fronds of ferns, the inflorescence of Boraginaceous plants, &c.

CI'RCINUS. The Compasses; a modern constellation, consisting of four stars, not very far from the South Pole.

CIRCLE (*circulus*, dim. of *circus*, a ring). A plane figure contained by one line, which is called the *circumference*, and such that all straight lines drawn from a certain point within the figure to the circumference are equal to one another; this point is called the *centre* of the circle, and the straight lines, *radii*, or rays.

1. *Circles, Arctic and Antarctic.* Circles supposed to be drawn round the Arctic and the Antarctic pole, at the distance of about 23½ degrees. On the terrestrial globe these circles surround what are called the two *frozen zones*, or girdles of the earth.

2. *Circle, Astronomical.* A term usually applied to an astronomical instrument, of which the sole or principal use is the measurement of angles of altitude, or zenith distance.

3. *Circles, Co-ordinate.* Two circles at right angles to each other; or two circles, one of which passes through the pole of the other. By reference to two such circles a point in the sphere is determined: *e.g.*, on the earth, by determining the longitude and latitude; in the starry heavens, by the right ascension and declination; in the visible hemisphere, by the azimuth and altitude.

4. *Circles, Concentric.* Circles which have the same centre, the one surrounding the other, as with a ring. Circles which are wholly or partially surrounded by another, but have different centres, are termed *eccentric.*

5. *Circle of Declination.* A circle on which declination is measured, *i.e.* a *horary* circle passing through the poles. According to some writers on Astronomy, the term denotes a parallel of any declination, or the small circle, all of whose points have the same declination; that is, a parallel to the equator.

6. *Circles, Tropical.* Circles drawn parallel to the equator through the solstices.

7. *Circle of Illumination.* That imaginary circle which divides the enlightened hemisphere of the earth from the darkened hemisphere.

8. *Circles of the Sphere.* Circles whose planes pass through the sphere, and have their circumference upon its surface. If the plane pass through the centre of the sphere, it is called a *great circle;* if not, it is called a *less circle.* The equator and ecliptic are great circles; the polar circles and the parallels of latitude or declination, are small circles.

9. *Circles of Perpetual Apparition.* Small circles parallel to the equator, and touching the horizon of any given place.

10. *Circles of Perpetual Occultation.* Small circles parallel to the equator, and touching the lower part of the horizon, or never appearing above it.

11. *Circles of Position.* Great circles of the sphere, passing through the common intersection of the meridian and horizon, and through any degree of the ecliptic, or centre of a star or planet.

CI'RCULAR PARTS. The name given to Napier's proposition in Trigonometry, which generalizes the relations between the parts of a spherical right-angled triangle under two formulæ.

CIRCULAR VELOCITY. The velocity of a revolving body, measured by an arc of a circle.

CIRCU'MFERENCE (*circum fero*, to carry round). A line which bounds a figure, commonly applied to curvilinear figures. The Greek synonymous term *periphery* is, however, applied to rectilinear figures.

CIRCU'MFEREN'TOR. An instrument used by surveyors for taking angles.

CI'RCUMFLEX VERBS. A term applied by Greek grammarians to those verbs which are also called *pure* or *contracted* because, after contraction, the *ω* receives a *circumflex*, as *φιλέω*, *φιλῶ*. See *Accent*.

CIRCUMPOLAR STARS. Stars which revolve round the pole, without setting in a given latitude. The number of these stars increases with the latitude of the place, or the elevation of the pole above the horizon.

CIRCUMSCI'SSILE (*circum*, around, *scindo*, to cut). Divided around by a transverse separation, as applied to that mode of *dehiscence* of fruits which occurs in hyoscyamus, in anagallis, in lecythis, &c.

CIRRHO'PODA (*κιῤῥὸς*, frizzled hair, *ποὺς*, *ποδὸς*, a foot). A class of aquatic invertebrate animals, with numerous lateral articulated cirrhi, and their body fixed in a multivalve shell. The class is composed chiefly of the barnacles and acorn-shells. The following orders have been distinguished:—

1. *Balanida*, or those which are enclosed in fixed, sessile, multivalve, conical shells, as the *balanus*.

2. *Anatifida*, or those which have the enveloping shell attached by means of a long fleshy contractile tubular peduncle, as in the *anatifa*.—*Grant*.

CI'RRHOSE (*κιῤῥὸς*, frizzled hair). Any thing which terminates in a tendril, or filiform appendage, as the leaf of several leguminous plants.

CI'RRI (plur. of *cirrus*, a curl). The curled filamentary appendages which represent the feet of the barnacles.

CIRRI'GRADA (*cirrus*, a curled lock of hair, *gradior*, to advance). A group of the *Acalephæ*, the lower surface of some of which is furnished with numerous appendages, called *cirri*, which are organs of prehension, and, it is supposed, of *progression*.

CI'RRIPEDES (*cirrus*, a curl, *pedes*, feet). A class of articulate animals, having curled jointed feet. See *Cirrhopoda*.

CIRRO-CUMULUS (*cirrus*, a curled lock of hair, *cumulus*, a heap). The *sonder-cloud;* an intermediate modification of clouds between the cirrus and the cumulus. It consists of extensive beds of numerous small well-defined orbicular masses of cloud, or small cumuli, in close horizontal opposition, but at the same time lying quite *asunder* or separate from each other. The prevalence of this cloud, in summer, forebodes an increase of temperature; in winter, the breaking up of a frost, and warm and wet weather.

CIRRO-STRATUS (*cirrus*, a curled lock of hair, *stratus*, a bed or covering). The *wane-cloud;* an intermediate modification of clouds between the cirrus and the stratus, distinguished by its flatness, and great horizontal extension in proportion to its perpendicular height. From its generally changing its figure, it has been called *wane-cloud*. Varieties of this cloud occur in the *mackerel-back sky* of summer evenings; and in the *cymoid* modification, which consists of small rows of little clouds, curved in a peculiar manner. The prevalence of these clouds is a sure sign of rain or snow; the cymoid variety always indicates stormy weather.

CI'RRUS (Lat., a lock of hair curled). The *curl-cloud;* a primary form of clouds, characterized by its *curling* and flexuous form, by the lightness of its appearance, its fibrous texture, and the great and perpetually changing variety of its figure. It accompanies a variable state of the weather, and forebodes wind and rain. The *comoid cirrus*, vulgarly called *mare's tail*, is the proper cirrus; it resembles a distended lock of white hair, or a bunch of wool drawn out into fine pointed ends. Modifications of this texture occur in the *linear cirrus*, in which the lines of cloud are parallel; and in the *reticular cirrus*, in which they cross each other in various directions, presenting the appearance of net-work.

CI'SSOID (*κισσὸς*, ivy, *εἶδος*, likeness). Resembling ivy; a fanciful designation of a curve line of the second order, employed by the Greeks in the celebrated problem of finding two mean proportionals between two given straight lines.

CISTA'CEÆ. The Cistus or Rock-rose tribe of Dicotyledonous plants; characterized by the fragrant resinous secretion of their leaves, the beauty of their fugitive flowers, and the production, from some of their species, of the green labdanum.

CISTE'LIDES. A family of Coleopterous insects, of the section Heteromera and subsection Stenelytra, named from the genus *cistela*.

CI'TRATE. A salt formed by the combination of citric acid with a base.

CI'TRENE (*citrus*, a lemon). A peculiar carburetted hydrogen, constituting the principal part of the volatile oil of lemons.

CI'TRIC ACID (*citrus*, a lemon). The acid of limes, lemons, &c. By exposure to heat, it is decomposed, with the formation of the *pyro-citric* and *citricic* acids.

CLADE'NCHYMA (κλάδος, a branch, ἔγχυμα, infusion). A modification of the *parenchyma* of plants, characterized by its *branched* form.

CLADO'CERA. An order of the branchiopodous Crustacea, in which the carapace is formed like a bivalve shell, and there are five pairs of thoracic members. A characteristic example occurs in the *daphnia pulex*, or water-flea.

CLAIRVO'YANCE. Clearsightedness; a peculiar mode of sensation, or second sight, connected with *somnambulism*, and supposed to be diffused over the whole surface of the body, but to be especially seated in the epigastrium and fingers' ends.

CLARIFICA'TION (*clarus*, clear, *fio*, to become). The process of clearing liquids, by *subsidence* of the suspended particles, and decantation of the supernatant liquor; by *filtration* through porous substances; or by *coagulation*, or the admixture of albumen, and the subsequent action of caloric, acids, &c.

CLA'VATE (*clavus*, a club). Club-shaped; a form in which one extremity is slender and pointed, while the other is thick and obtuse, as in many of the zoophagous mollusca; in filaments, styles, and the vittæ of umbelliferous plants.

CLAVICO'RNES (*clavus*, a club, *cornu*, a horn). A family of the pentamerous *Coleoptera*, characterized by the club-shaped form of the extremities of the antennæ, the terminal points frequently forming a club.

CLAW OF PETAL. The narrow part at the base of some petals, which is analogous to the foot-stalk of a leaf, as in the pink.

CLAY. An argillaceous rock, of an unctuous, soft, friable, and dense homogeneous texture, forming a tenacious paste with water, and of various colours. The varieties of clay are essentially silicates of alumina.

1. *Indurated Clay* is a variety of trap rocks, with a dull earthy fracture, varying in colour from greenish-grey to greyish-white, or red, or brown, or even black.

2. *Kimmeridge Clay* is a subdivision of the Upper Oolite Formation, of a blue or yellowish colour, more or less slaty or passing into slate, sometimes so impregnated with bitumen as to be used for fuel, and containing remains of saurian reptiles and shells.

3. *Oxford Clay*, or *Clunch Clay*, is also a subdivision of the Middle Oolite Formation, of a dark blue colour; some of the beds are bituminous, and abound in septaria, or masses having internal dissepiments. In its lower part are beds of Kelloway rock, calcareous grit or sandstone, coral rag and oolite, and calcareous sandstone.

4. *Weald Clay*. The upper portion of the Wealden Formation, composed of beds of clay of a bluish or brownish colour, sandstone, calcareous sandstone, conglomerate, limestone, and iron-stone. The mass contains scales of mica, iron-pyrites, crystals of selenite, and traces of lignite.

CLAY IRON-ORE. One of the ferriferous rocks from which iron is procured in great abundance. It is of an earthy aspect, with an even or conchoidal fracture, yellow streak or powder, and dull colours.

CLAY SLATE. By this name different rocks have been designated. 1. A *micaceous* rock is so named, appearing to be mica-slate in a state of extreme division, the scales of mica having gradually become so attenuated, as to give it a homogeneous, glistening appearance. 2. A more extensive series of strata of clay-slate is found associated with grey-wacké and other rocks of a less crystalline texture than the primary, and occurs in the *Cumbrian* and the *Cambrian Groups* of rocks.

CLAYSTONE. Compact felspar, with an earthy aspect, conchoidal uneven fracture, and of various colours. It is often porphyritic, containing crystals of felspar. It occurs in veins, as well as in mountain masses.

CLEAVAGE. The mechanical division of crystals, by which the inclination of their *laminæ* is determined.

Certain rocks, usually called slate-rocks, admit of being cleaved into an indefinite number of thin laminæ which are parallel to each other, but which are generally not parallel to the planes of the true strata or layers of deposition. The *planes of cleavage* are, therefore, distinguishable from those of stratification.

CLEA'VLANDITE. A mineral formerly ranked among felspars, but differing in this, that the 13 or 14 per cent. of potash in felspar is replaced by about 10 per cent. of soda in the cleavlandite.—*Ure.*

CLEF. The French term for *a key*. In music, it is a symbol placed at the beginning of the staff to determine the names of the lines and spaces, and the character of each note. 1. The *treble clef* is placed on the second line, to which it gives the name of G. 2. The *mean clef* gives the name of C to any line on which it is placed. It is called the *soprano clef* when placed on the first line; the *mezzo soprano*, when on the second; the *alto*, *contratenor*, or *countertenor*, when on the third; and the *tenor*, when on the fourth. 3. The *base clef* is placed on the fourth line, to which it gives the name of F.

CLEPSY'DRA (*κλεψύδρα*, from *κλέπτω*, to steal, *ὕδωρ*, water). A water-clock, made somewhat like our *sand-glasses*, with a narrow orifice through which the water trickled slowly, used by the Greeks to time speeches in the law-courts. This instrument was commonly employed by astronomers for the measurement of time before the invention of clocks and watches.

CLE'RIDÆ. A family of *Coleopterous* insects, of the section Malacodermi, named from the genus *Clerus*.

CLIMACTE'RIC (*κλιμακτὴρ*, the step of a ladder). The progression of the life of man. It is usually divided into periods of seven years; the ninth period, or 63rd year, being the *grand* climacteric.

CLI'MATE (*κλίμα*, inclination). A term applied in its popular sense to the state of the air, in order to express the particular combination of temperature and moisture, which exists in the atmosphere of any given country.

In its geographical and technical application, *Climate*, or *Clime*, denotes an imaginary narrow belt of the globe, parallel to the equator; and is so called because the difference of climates depends on the *inclination*, or obliquity of the sphere. The belts constituting the several climates are small, depending on the average length of the longest day: that of each increasing by half an hour, from the equator to the polar circles, when the climates are counted by months, till they reach the poles.

CLI'MAX (*κλῑμαξ*, a ladder or staircase). In rhetoric, a gradual ascent from weaker to stronger expressions, as in the celebrated "gradatio" of Cicero,—*abiit, excessit, evasit, erupit.*

CLINA'NTHIUM (*κλίνω*, to incline, *ἄνθος*, a flower). A term applied by some botanical writers to the receptacle of compositæ which is not fleshy, but is surrounded by an involucrum. By other writers, this part is called *thalamus* and *phoranthium*.

CLINKER. Black oxide of iron, or the *oxidum ferroso-ferricum* of Berzelius. It is always formed when iron is heated to redness in the open air, and is therefore readily obtained at the blacksmith's forge.

CLINKSTONE. A hard felspathic rock, named from the sharp noise which it emits when struck with the hammer; its fracture is splintery and conchoidal, its lustre glistening, its colours various, often with veins of jasper.

CLINO'METER (*κλίνω*, to incline, *μέτρον*, a measure). A quadrant adapted for showing the inclination of strata in geological operations.

CLIO'NIDÆ. The Clio tribe; a family of naked marine mollusca, the first order of Cuvier's Pteropods.

CLOA'CA (a sewer). A receptacle observed in the monotremata, in birds, in reptiles, and in many fishes, which receives the fæces and the urine, together with the semen of the male, and the ovum of the female.

CLOCK. A well known machine for measuring time, regulated by the uniform motion of a pendulum. Common clocks are made to show mean solar time, but those used at observatories, for the purpose of observing the time of the stars transiting the meridian, show sidereal time.

CLOUDS. Masses of visible aqueous vapour, which float in the sky, or drift through it with the wind, at different elevations, assuming every variety of colour and form. They have been classified by Howard under three primary forms, and four modifications.

1. *Primary Forms.* These are the *cirrus*, or curl-cloud, composed of fibrous stripes, which are parallel, flexuous, or diverging, and extensible in all directions; the *cumulus*, or stacken-cloud, heaped together in convex or conical masses, and increasing upwards from a

horizontal base; and the *stratus*, or fall-cloud, spreading horizontally in a continuous layer, and increasing from below. The first of these forms is confined chiefly to the higher regions of the atmosphere; the second occupies a lower, but still an elevated station; the third usually rests upon the surface of the earth, constituting mists.

2. *Modifications.* Of the four modified forms of clouds, two are intermediate, and two are composite. 1. The intermediate forms are the *cirro-cumulus*, consisting of small, roundish, and well-defined masses in close horizontal arrangement; and the *cirro-stratus*, likewise in small and rounded masses, but attenuated towards a part, or towards the whole, of their circumference. 2. The composite forms are the *cumulo-stratus*, made up of the cirro-stratus blended with the cumulus, the cirro-stratus being either intermingled with the larger masses of the cumulus, or widely enlarging the cumulous base; and the *cumulo-cirro-stratus*, *nimbus*, or rain-cloud, being a horizontal layer of aqueous vapour, over which clouds of the cirrous form are spread, while other clouds of the cumulous form enter it laterally and from beneath.

CLOVES. A technical appellation of the small bulbs developed at the base of a parent bulb.

CLUPE'IDÆ. The Herring tribe; a family of *Malacopterygious* or soft-spined fishes, named from the genus *Clupea*, and differing from the Salmonidæ in the absence of fatty matter in the dorsal fin.

CLY'PEIFORM (*clypeus*, a shield, *forma*, shape). Shield-shaped; a term applied to the large prothorax in beetles. *Clypeate* is a similar term, applied, in Botany, to the scales found on the leaves of certain plants, and synonymous with scutate or scutiform.

COAGULA'TION (*con* and *agere*, to bring together). A term formerly synonymous with crystallization, but now applied to the partial solidification of a fluid body by exposure to cold, or by the addition of some agent. *Spontaneous coagulation* denotes the cohesion of the particles of the blood, of some effused fluids, &c. *Induced coagulation* denotes the effect produced upon albumen by heat, alcohol, acids, rennet, &c.

COAL. A combustible mineral, consisting of bitumen, carbon, and earthy matter, in various proportions. The varieties are easily recognized, being hard, black, brittle, and laminated. *Peat*, which consists of partially decomposed roots and stems of various plants, may be considered as forming one extremity of the series, which terminates in the other with *glance coal* or anthracite.

COAL FORMATION. A term generally employed as synonymous with that of *coal measures* or *carboniferous group*. This very comprehensive group embraces not only the coal strata, and the beds of sandstone, limestone, and others alternating with it, but the mountain limestone and the old red sandstone, on which the proper coal group may be said to rest.

Werner's Coal Formations. The first or oldest is called the *independent* formation, from the individual depositions composing it being independent of, and unconnected with, each other. The second occurs in the newest floetz-trap formation; the third in alluvial land. A fourth would comprehend peat and other similar substances.

COAL GAS. A gas procured from coal, when subjected in close vessels to a red heat, and employed for illumination.

COA'RCTATE (*coarcto*, to compress). An epithet applied to the pupa of an insect, which is enclosed in a case, giving no indication of the parts contained in it.

COARSE COAL. A sub-species of black coal, occurring in the German coal formations. To this head is also referred the *soot coal*, which occurs together with slate-coal, in the Forth district, &c.

COATING. *Lorication.* A method of securing or repairing retorts used in distillation. *Coatings* are made of marly earth, kneaded with fresh horse-dung, slaked lime, and linseed oil, &c.

COBALT (*Cobalus*, the demon of mines). A metal, found chiefly in combination with arsenic, as arsenical cobalt; or with sulphur and arsenic, as grey cobalt ore. These ores are employed to give the blue colour of porcelain and stone-ware.

CO'BALUS. The demon of mines, which obstructed and destroyed the miners. The Germans formerly used a form of prayer for the expulsion of the fiend. The ores of *cobalt*, being at first mysterious and intractable, received their name from this personage.

CO'CCIDÆ (*coccus*, the cochineal insect). The Scale insects; the single family of the monomerous Homoptera, remarkable for the production of *cochineal* and other valuable dyes.

CO'CCOLITE (κόκκος, a kernel, λίθος, a stone). A green mineral, occurring in loosely aggregated concretions, together with granular limestone and other substances, in beds subordinate to the trap formation.

COCCOO'N (κόκκος, a berry or kernel). The silken case which certain insects spin for a covering during the period of their metamorphosis, as that of the silkworm when passing into the pupa state.

CO'CCUS (κόκκος, a kernel). A term applied, in Botany, to a pericarp of dry, elastic pieces, or *coccules*, as in Euphorbia. In this plant, the cocci are three in number, and the fruit, generally called a regma, is therefore also termed a *tricoccous* capsule.

COCHINE'AL. The technical name of the *coccus cacti*, a homopterous insect, brought from Mexico, and employed by dyers. *Cochinilin* is a colouring matter obtained from cochineal, and is a constituent of carmine. The term *granilla* is applied to very small insects of this kind, from their resemblance to little grains.

CO'CHLEATE (*cochlea*, from κόχλος, a conch). Shell-shaped; shortly spiral, like a snail's shell, as the legume of medicago falcata.

COCI'NIC ACID. *Cocostearic acid.* The crystallizable acid of the butter of the cocoa nut.

CO'DA (*coda*, Ital., a tail). In Music, a passage of variable length at the end of a movement which follows a lengthened perfect cadence.

CO'DEINE (κώδεια, a poppy head). One of the vegetable bases of opium.

CO-EFFICIENT. A term applied, in Algebra, to the number, negative or positive, which is prefixed to any algebraical quantity, to show how often it is to be taken. It is that *factor* which is a number, as $3a$, or $5a^2c$.

CŒLELMI'NTHA (κοῖλος, hollow, ἕλμινς, a worm). Intestinal worms which are hollow, and contain an alimentary tube in the cavity of the body. These are the *cavitary intestinal worms* of Cuvier, the *nematoidea* of Rudolphi.

CŒNO'BIO (κοινόβιος, living in communion with others). The term by which Mirbel designates the fruit of the Labiatæ. It differs from the *carcerule* merely in the low insertion of the style into the ovaria, and the distinctness of the latter.

COHE'SION (*cohæreo*, to stick together). That relation among the component parts of a body, by which they *cohere*, or are kept together. The unknown principle by which particles cohere is called the *attraction of cohesion.* On the degree of this force depend the *aggregate forms* of matter, distinguished as the solid, the liquid, and the gaseous.

COHOBA'TION. The continuous redistillation of a liquid from the same materials, or from a fresh parcel of the same materials.

COKE. The residue of coal, when the volatile matters have been driven off.

CO'LCOTHAR. The brown-red oxide of iron, which remains after the distillation of the acid from sulphate of iron. It is used for polishing glass, &c., under the name of *crocus*, or *crocus martis.*

Col
See L
ant.

COLEOPHY'LLUM (κολεὸς, a sheath, φύλλον, a leaf). *Coleoptile.* In Botany, the sheath within which the young leaves of monocotyledons are developed. By the term *coleorrhiza* (ῥίζα, root), Mirbel designates the sheath at the base of the radicle of monocotyledons.

COLEO'PTERA (κολεὸς, a sheath, πτερὸν, a wing). Sheath-winged insects; an order of insects which have four wings, the upper pair being crustaceous, and forming a sheath, or shield (*elytron*), to the lower pair, as in the beetle. The order has been distinguished by Latreille, with reference to the number of joints in the *tarsi*, or divisions of the foot, into the pentamera, heteromera, tetramera, and trimera.

COLLE'CTOR, ELECTRICAL. The upper plate or disc of a *condenser*, employed for collecting electricity.

COLLE'CTORS. A term applied, in Botany, to those hairs with which the style of Compositæ, Campanulaceæ, and others, is often densely covered, and which seem intended as brushes to *collect* and clear the pollen out of the cells of the anthers.

COLLE'NCHYMA (κόλλα, glue, ἔγχυμα, infusion). A term applied by Link to the cellular substance in which the pollen of Orchidaceous and Asclepiadaceous plants is generated. It is supposed to constitute the appendage of the pollen-masses of the former of these tribes of plants.

COLLIMA'TION, LINE OF (*collimo*, for *collineo*, to level, or aim in a right line). The line of sight in an astronomical or geodesical instrument. The central line of a telescope, or that which joins the centres of its object-glass and its eye-glass, is called in Astronomy its *line of collimation*. The difference between the existing and the required positions of an instrument is called the *error of collimation*. This error is determined, without reversal of the instrument, by means of a contrivance called a *collimator*.

CO'LLUM. The neck. This term denotes, in Botany, that portion of the axis of growth where the stem and the root diverge: by Grew it was termed *coarcture;* by Lamarck, *vital knot*.

CO'LOPHONITE. A mineral with a *resinous* fracture, found in magnetic iron-stone in Norway, identical with the resinous garnet of Haüy and Jameson.

CO'LOPHONY. Resin of turpentine; the residue of common turpentine, after its essence has been removed by distillation. It is not a homogeneous product, but has been divided into two different resins, named by Unverdorben the *sylvic* and *pinic acids*.

COLOURS. A general term for those modifications of *light*, whether direct or reflected from other bodies, by which the sight is affected with distinct sensations. The *colour of a body* is designated by the particular species of light reflected from its surface, which may therefore be called the *objective* colour, or that which is permanent to the body.

1. *Prismatic Colours.* Colours produced by transmitting white light through colourless prismatic bodies. The light undergoes refraction, and is *dispersed*, presenting the phenomenon of the solar or *prismatic spectrum*. The colours exhibited by opaque or non-luminous substances, when they either reflect or transmit white light, are called *natural colours*.

2. *Primary Colours.* These are red, orange, yellow, green, blue, and violet, being the different colours into which a solar ray of light may be decomposed. *White* is, therefore, a compound of these colours, and *black* is the absence of all colours. The primary colours are not decomposable, but have uniform refraction; hence they were termed by Newton, *homogeneous* colours, to distinguish them from common or white light, which he called compound or *heterogeneous*.

3. *Secondary Colours.* According to Brewster, there are only three *primary* or *fundamental* colours; *viz.* red, yellow, and blue; the other three, *viz.* orange, green, and violet, being produced by combination of the former, and therefore properly termed *secondary* or *compound* colours.

4. *Complementary Colour.* That colour with which each of the prismatic colours will combine, and form white light. The complementary colour to each of the three primaries, is the compound colour obtained by combining the other two primaries; and, for each of the secondaries, that primary one which does not enter into its composition.

5. *Accidental Colours.* A series of optical phenomena, commonly called *ocular spectra*. If the eye be steadily directed, for some time, to a *white* wafer upon a *dark* ground, and be then turned aside, a spectrum of the wafer will be perceived, with the *colours reversed:* the wafer will appear dark, the ground white. If the wafer be red, its spectrum will be bluish-green; if orange, blue; if blue, orange-red, &c. Darwin classes the spectra under the heads of *direct* and *reverse*, the former depending on the permanence of the impression, the latter upon exhaustion. Accidental colours are sometimes called *subjective* or *physiological*, to distinguish them from the permanent or *objective* colours.

6. *Entoptic Colours.* A term applied by Seebeck to the spectra obtained by transmitting polarized light through a crystal cut at right angles to its axis, the light being made to pass in the direction of the axis. The phenomena consist of concentric rings of various colours, resembling Newton's prismatic rings, and intercepted in the middle by a rectangular cross.

COLOURED RINGS. Luminous rings produced by interference of the rays of light, or by electro-chemical decomposition. Of the former kind are *Newton's coloured rings*, which may be produced by pressing a watch-glass upon a piece of plate-glass; the rings will appear about their point of contact, of the same colour as the incident rays, if the light be homogeneous. Of the second kind are *Nobili's rings*, which are produced when a feeble current of electricity is directed upon a polished metallic plate, this plate being used as an electrode, and immersed in an electrolytic fluid; the rings will then appear upon the plate.

COLOURING MATTER. Colouring principles found in vegetable substances, and employed in dyeing. Colours are termed *substantive*, when they adhere to the cloth without the intervention of a base; *adjective*, when they require a base for that purpose.

COLPE'NCHYMA (κόλπος, a loose fold, ἔγχυμα, infusion). A term applied by Morren to the *sinuous* form of the parenchyma of plants.

COLUBE'RIDÆ (*coluber*, a snake). A family of Ophidian reptiles, including the Boa Constrictors of the New World and the Pythons of the Old, and other non-venomous snakes not belonging to the other families of the order.

COLU'MBA NO'ACHI. Noah's Dove; a modern southern constellation, consisting of ten stars, close to the hinder feet of Canis Major.

COLUMBE'LLINÆ. Dove-shells; a sub-family of the *Strombidæ*, or Wing-shells, named from the typical genus *columbella;* these are small shells, with sharp-pointed spires; the outer lip is thick, turned inwards, more or less toothed on its edge, and gibbous above; there are also tuberculated teeth at the base of the inner lip, but no regular plaits.

COLU'MBIDÆ (*columba*, a dove or pigeon). The Pigeon tribe; a group of the *Rasores*, or Scratching birds, characterized by the double dilatation of the crop, and their habit of feeding their young with food disgorged from this receptacle. Macgillivray considers that the *Pigeons* belong neither to the Rasores nor to the Insessores, but appear to form an order separated by well-defined limits. See *Gemitrices.*

COLUMBIUM. Another name for the metal *tantalum*, from its having been brought, as it is said, from Massachusetts in North America. By fusion of its ore, or *columbite*, an acid is obtained, called *columbic acid.*

COLUME'LLA (dim. of *columna*, a pillar). A little pillar; the internal support of most spiral shells, round which the whorls are convoluted. In botany, it denotes the *axis* from which the valves of a fruit separate, on dehiscence; the *axis* which occupies the centre of the sporangium of mosses, &c.

COLU'MNA. A column; a term applied, in botany, to the solid body formed by a combination of the filaments, as in stapelia, rafflesia, &c.

COLURES (κόλουρος, a truncated tail). An old term employed in Astronomy to designate two great circles of the sphere, which pass, the *equinoctial colure* through the equinoctial points and the poles of the equator, the *solstitial colure* through the solstitial points and the poles of the ecliptic and of the equator.

COLY'MBIDÆ (*colymbus*, a diver). The Divers; a small family of the *Natatores*, or Swimming birds, characterized by remarkably short wings, and a lengthened, strong, straight bill.

CO'MA. Literally, hair; and hence applied to the assemblage of branches which forms the head of a forest tree. *Cyma* is sometimes employed, though erroneously, to express the same thing.

COMA BERENI'CES. Berenice's Hair; a modern northern constellation, consisting of forty-three stars, and named after the wife of Ptolemy Euergetes.

COMBINATIONS. In Algebra, the *combinations* of any number of quantities are the different sets which can be made of them, taking a certain number together, without regard to the order in which they are placed. Thus, the combinations of *a*, *b*, *c*, *d*, taken 3 together, are *abc*, *abd*, *acd*, *bcd*.

COMBINATION, CHEMICAL. The union of the particles of different substances, by chemical attraction, in forming new compounds. See *Atomic Weights.*

COMBINING QUANTITY. Various terms have been proposed for expressing the combining quantities of elementary and compound substances, and all objectionable. *Atom* is not only hypothetical, but often inapplicable, as when half atoms occur. *Equivalent* is only expressive when comparison with a correlative equivalent is directly implied. *Proportion* means similitude of ratios. *Proportional* is one of the terms of a proportion. *Combining quantity* or *weight* is sometimes expressive; but, besides being unwieldy, it is not always applicable. Dr. Donovan adds, the word *dose* is universally employed to designate a *determinate* or *definite quantity* of a thing *given;* it has the quality of involving nothing beyond a fact, and can often be used with advantage.

COMBU'STIBLE. A body which, in rapid union with other bodies, disengages heat and light. *Simple* combustibles are hydrogen, carbon, boron, sulphur, phosphorus, nitrogen, and the metals; *compound* combustibles are the hydrurets, carburets, sulphurets, phosphorets, metallic alloys, and organic products.

COMBU'STION (*comburo*, to burn together). The act of burning; a phenomenon produced by the chemical combination of two substances, attended by the development of heat and light; it usually takes place in the combination of oxygen, but, in a few cases, in that of chlorine and of sulphur. Bodies which are considered as the causes of this phenomenon are called *supporters of combustion*, whilst the radicals which combine with them are called *combustibles*.

1. *Combustion, Invisible*. A term applied by Davy to those phenomena of combustion which are effected without the disengagement of light, as when oxygen and hydrogen, confined in tubes, are carefully exposed to a high temperature.

2. *Combustion, Spontaneous*. This is said to occur in the human body; and it does occur when masses of vegetables, as damp hay, or oily cotton, are heaped together. There are also cases on record of the spontaneous ignition of charcoal, both dry and moist.

COME'NIC ACID. A bibasic acid, formed from the *meconic* acid, of which it is a congener. It is decomposed by heat, and another congener is produced, viz. *pyromeconic acid*.

CO'MET (κομήτης, from κόμη, hair). Literally, a *hairy* star. A celestial body which occasionally traverses our system in a very eccentric orbit, without appearing to form a part of it. Its central point, which is more or less lustrous, is called its *nucleus*. The nebulous light surrounding the nucleus, is the *chevelure* or hair. The luminous train by which most comets are accompanied was formerly called *beard* or *tail*, accordingly as it preceded or followed the comet in its course. At present it is called *tail*, whatever be its position. Lastly, the nucleus and the chevelure together constitute the *head of the comet*.

COMETA'RIUM. A machine showing the motion of a comet about the sun; any instrument capable of describing an elongated ellipse.

COMMA (κόμμα, that which is struck). The smallest interval in music, being the ninth part of a major tone.

COMMISSU'RAL (*committo*, to solder). Belonging to a line or part by which other parts are connected together. The connecting line is the *commissure*.

COMMON MEASURE. In Arithmetic, a number which divides two or more other numbers without leaving a remainder.

COMMON TERM. A logical expression for a term which is applicable in the same sense to more than one individual object. Common terms, therefore, are called "predicables," that is, *affirmatively* predicable, from their capability of being affirmed of others. See *Singular Term*.

CO'MMUTATOR or GY'ROTROPE. An apparatus included in the circuit between the battery and the electro-magnetic apparatus, for the purpose of reversing the direction of the current without the necessity of changing the arrangement of the conductors from the poles.

COMPASS, MARINER'S. A magnetic needle, balanced on a pivot, for pointing out the true direction of north and south. In the *mariner's compass*, the circle traversed by the point of the needle is marked off into 32 *rhumbs* or *points*; in the *azimuth compass* the same circle is divided into 360°.

COMPA'TIBLE TERMS. In Logic, terms expressive of two views which may be taken of the same object at the same time, as to be "white and cold." See *Opposite terms*.

COMPENSATION PENDULUM. A pendulum made of different substances, so combined that the effects of heat counteract each other, and the length of the rod remains unaltered.

CO'MPLEMENT (*compleo*, to fill up). A magnitude which, taken with another, makes up a given magnitude. The *complement of an arc* or *angle* is what is required to complete a quadrant or right angle. The arithmetical *complement of a number* is the number by which it falls short of the next higher decimal denomination. The *complement of a logarithm* is the number by which a logarithm falls short of 10. The *complement of altitude* is the zenith distance; that of *latitude*, the ~~polar distance.~~ Colatitude

COMPOSITÆ. The Synantherous tribe of dicotyledonous plants. Herbaceous plants or shrubs with *leaves* alternate or opposite; *flowers* (called *florets*) unisexual or hermaphrodite, collected in dense *heads* upon a common receptacle, surrounded by an involucrum; *florets* monopetalous; *anthers* syngenesious; *ovarium* one-celled; *fruit* a dry, indehiscent pericarp, termed achenium or cypsela.

COMPOSI'TION (*compono*, to put together). A technical term used by geometers to signify one of the ways of changing the order or magnitude of proportionals, so that they continue still to be proportionals. Thus of four proportionals, the first, together with the second, is to the second, as the third, together with the fourth, is to the fourth. See *Force*.

COMPOSI'TION, FALLACY OF. A logical fallacy, in which the middle term is used in one premiss *collectively*, in the other *distributively*. The form in which it is most usually employed, is to establish some truth, *separately*, concerning *each member* of a certain class, and thence to infer the same of the *whole collectively*. Thus, it may be argued that, because it is not very improbable that a person may throw sixes in any one out of a hundred throws, therefore it is no more improbable that he may throw sixes a hundred times running. *Whately*.

COMPOUNDS. The following terms are employed in designating compounds:

1. *Binary*, *ternary*, *quaternary*. These terms refer to the number of *elements* or proximate principles—two, three, or four—which exist in a compound. The *binary* compounds of oxygen, chlorine, iodine, bromine, and fluorine, which are not acid, terminate in *ide*, as oxide, chloride, &c.; those of all other substances terminate in *uret*, as hydruret of carbon, sulphuret of iron, &c.

2. *Bis*, *ter*, *quater*. These are Latin numerals, indicating the number of *atoms* of acid, which are combined with one of the base in a compound, as *bi*-sulphate of soda, &c.

3. *Dis*, *tris*, *tetrakis*. These are Greek numerals, indicating the number of *atoms* of base, which are combined with one of the acid in a compound, as *di*-chromate of lead, &c. No prefix is used when the compound consists of one atom of each ingredient. But there are many exceptions to these rules: protoxide and deutoxide are frequently used for oxide and bin-oxide respectively.

COMPRESSIBI'LITY (*comprimo*, to compress). A property of masses of matter, by which their particles are capable of being brought nearer together. Bodies which recover their former bulk on removal of the compressing cause, are called *elastic*.

CO'MPTONITE. A mineral found in drusy cavities, in ejected masses, on Mount Vesuvius; first brought to this country by Lord Compton, in 1818.

CONCENTRA'TION. The strengthening of solutions or mixtures by evaporation of their watery parts.

CONCE'NTRIC. Having the same centre, as applied to *circles* which are described about the same point, to the striæ of bivalves which run parallel to the margin, &c. The *concentric theory* is the theory of epicycles, as opposed to the eccentric theory. See *Epicycle*.

CONCEPTA'CULUM. Literally, a receptacle; a term applied, in Botany, to a species of compound fruit, which is two-celled, many-seeded, superior, separating into two portions, the seeds of which detach themselves from their placenta, and lie loose in the cavity of each cell. This fruit occurs in *Asclepias*, and is also called the *double follicle*.

CONCHA'CEA (κόγχη, a shell). A family of conchiferous molluscs, in De Blainville's arrangement, corresponding with Cuvier's Cardiaceæ, or the Cockle tribe. See *Cardiaceæ*.

CONCHI'FERA (*concha*, a shell, *fero*, to carry). A class of the Mollusca, comprising acephalous aquatic animals, covered with a bivalve or multivalve shell. There are two orders, viz.—

1. *Monomyaria*, in which the shells are narrow longitudinally, and have but one muscular impression on the valve, as in the *spondylus*.

2. *Dimyaria*, in which the shell is extended longitudinally, and has two muscular impressions on the valve, as in the *arca barbata*.

CONCHOID (κογχοειδὴς, resembling a shell). The designation of a curve, employed by Nicomedes for finding the two mean proportionals, and the duplication of the cube.

CONCHO'LOGY (κόγχη, a shell, λόγος, a description). The "art" of arranging the shells of testaceous animals, without reference to the animals which they contain. See *Malacology*.

CONCLU'SION. In Logic, the proposition which is inferred from the premises of an argument.

CO'NCORD. A term applied in Music to two combined sounds which are universally agreeable to the ear. The 8th, or octave, and the 5th are called *perfect* concords, because as concords they are not liable to alteration by flats or sharps; the 3rd and 6th are termed *imperfect* concords, because alterable.

CONCRETE. A term denoting a quality accompanied with its particular subject, as opposed to *abstract*, which denotes the quality without its subject. The names of classes are abstract, those of individuals concrete; and from concrete adjectives are made abstract substantives. See *Abstract*.

CONCRE'TIONARY DEPOSITS. In Geology, a designation of those Recent or

Alluvial strata, which include calcareous and other deposits from springs, stalactites, travertines, bog iron-ore, and salt.

CONCU'RRENTS. Common years consist of 52 weeks and 1 day, and Bissextile years consist of 52 weeks and 2 days. The day or two days supernumerary are called *Concurrents*, because they concur with the Solar Cycle, whose course they follow. The first year of this cycle is termed Concurrent 1, the second 2, the third 3, the fourth 4, the fifth 6 (instead of 5, because that year is bissextile), the sixth 7, the seventh 1, the eighth 2, the ninth 4 (instead of 3, because that year is likewise bissextile), and thus, with the other years, always adding one in common years, and 2 in bissextile years; and always recommencing with 1 after having reckoned 7, because there are no more than 7 Concurrents,—that being the number of days in a week and of the Dominical Letters.

CONDENSA'TION (*condenso*, to thicken). The act of diminishing the bulk of a body, by *compression*, as in the conversion of gases into liquids, of liquids into solids; or by *cold*, as in the conversion of steam into water.

CONDE'NSER (*condenso*, to thicken). 1. A vessel in which steam is condensed, or converted into water, by the application of cold. 2. An apparatus used for detecting the presence of electricity, by collecting and condensing it before it gains a sufficient degree of tension to affect the electroscope. Its action depends on the induction of electricity, and on this being held in a latent state.

CONDENSING SYRINGE. A hollow metallic cylinder, furnished with a piston, piston-rod, and receiver, for increasing the density of air in a given space.

CONDITIONAL PROPOSITION. In Logic, a proposition which asserts the dependence of one categorical proposition on another. A *conditional syllogism* is one in which the reasoning depends on such a proposition.

CONDU'CTION (*conduco*, to bring with). A term expressive of that property by which certain bodies transmit heat, or electricity, through their substance. The rate at which this equalization is effected in any body is the measure of its *conducting power*; and substances are, accordingly, divided into *good* and *bad conductors* with reference to this power.

CONDUCTORS METALLIC. A term applied to long metallic rods, whose points are raised above buildings for the purpose of attracting or receiving the electric fluid, and of conducting it into the earth, or into water, thereby to prevent such buildings from being struck by lightning.

CONDU'RRITE. An ore of copper found in a vein in Condurrow mine, in Cornwall.

CONDYLO'PODA (*κόνδυλος*, a joint, *ποὺς*, *ποδὸς*, a foot). Articulated animals with jointed legs, as insects, crabs, and spiders.

CONE (*κῶνος*, a cone). A geometrical solid, with a circular base, tapering equally upwards until it terminates in a vertex or point. A right line drawn from the vertex to the centre of the base, is termed the *axis* of the cone. When this axis is at right angles to the base, the solid is termed a *right cone;* if otherwise, it is an *oblique*, or *scalene cone.*

CONE, in BOTANY. The fruit of the Coniferæ, or Fir-tribe of plants, consisting of a conical amentum, of which the carpels are scale-like, spread open, and bear naked seeds.

CONE OF RAYS. The rays of light which fall from a luminous point upon a given surface, as upon the object-glass of a telescope.

CONE'NCHYMA (*κῶνος*, a cone, *ἔγχυμα*, infusion). A term applied by Morren to that form of parenchyma in plants, which is conical, as in hairs.

CONFERVÆ. A section of Algaceous plants, consisting of simple tubular jointed species inhabiting fresh water.

CONFLA'TION (*conflo*, to blow together). The process of casting or melting of metals.

CO'NFLUENT (*confluo*, to flow together). Growing together; a term synonymous with *connate*, expressive of the cohesion of homogeneous parts.

CONFO'RMABLE. A term applied in Geology to the planes of one set of strata which are parallel to those of another set which are in contact with them.

CONGELA'TION (*congelo*, to freeze). The passing from a fluid to a partially or wholly solid state, by the agency of cold.

CO'NGENER. That which is of the same kind; a term applied to species which belong to the same genus.

CONGLO'MERATE (*conglomero*, to heap together). *Puddingstone.* Rounded water-worn fragments of rock or pebbles, cemented together by another mineral substance, which may be of a silicious, calcareous, or argillaceous nature. The term is synonymous with the Italian word *breccia*.

CONIC SECTIONS. The designation of that science which treats of the properties of certain curves which are formed by the *cutting of a cone*. These curves, or sections, are the ellipsis, the parabola, and the hyperbola.

CONICAL PROJECTION. A method of describing a representation of a part of a sphere upon a plane.

CO′NICINE. A vegeto-alkali existing in all parts of the conium maculatum, or hemlock. It is also called *conia* and *coneine*.

CONI′FERÆ. The Fir or cone-bearing tribe of Dicotyledonous plants. Trees or shrubs with a stem abounding with resin; *leaves* linear, acerose, or lanceolate; *flowers* monœcious, or diœcious; *ovarium* in the cones, spread open, appearing like a flat scale destitute of style or stigma; *fruit* a solitary naked seed or a cone; *seeds* with a hard crustaceous integument.

CONI′NÆ. The Cone-shells; a subfamily of the *Strombidæ*, or Wing-shells, named from the typical genus *conus*, having the spire so depressed as to be turbinated, and scarcely raised above the body-whorl; the aperture is always smooth; the outer lip without any lobe, and only slightly detached above.

CONIRO′STRES (*conus*, a cone, *rostrum*, a beak). A large group of the *Insessores*, or Perching birds, characterized by a stout beak, more or less conical, and with regular edges, including the crows, starlings, finches, hornbills, and crossbills. The structure of their feet enables them to walk on the ground with nearly the same facility as they perch upon trees.

CO′NITE. A mineral found in the Meissner trap-hill in Hessia, &c. The same name has been applied to another pulverulent mineral, found in the trap-hills of Kilpatrick and other places.

CO′NJUGATE (*conjugatus*, yoked together). A term applied, in Mathematics, to two lines, points, &c., when considered together in any property in such a manner that they may be interchanged without altering the way of enunciating the property.

CONJUGATION (*conjugo*, to yoke together). A term, in grammar, denoting all the inflexions of a verb, with relation to mood, time, number, person, voice, &c.

CONJUNCTION (*conjungo*, to join together). A part of speech used to join words and propositions together. It is termed *copulative*, when it not only joins the *words*, but indicates that the *things* are to be united; *disjunctive*, when it unites the words, but indicates that the things are to be separated.

CONJUNCTION and OPPOSITION. When a planet, as seen from the earth, is in the same direction as the sun, it is said to be in *conjunction with the sun*. This, however, in the case of an inferior planet, may be either when it passes between the sun and the earth, or when it is on the further side of the sun; the former is the *Inferior*, and the latter the *Superior Conjunction*. A superior planet, never passing between the sun and the earth, is only once in conjunction with the sun during its revolution. In the point of its orbit, when the earth is between it and the sun, the planet is said to be in *Opposition* to the sun. The *Conjunctions* and *Oppositions* of the moon have the general name of *Syzygies*.

CONNATE (*connascor*, to be born together). Born with another; congenital. A term applied in botany to two opposite leaves united at their bases, as in the garden honeysuckle.

CONNE′CTIVE. That part of the stamen in plants which *connects* the two lobes or cells of the anther; it is usually continuous with the filament, but is frequently enlarged in various ways.

CO′NOID (κῶνος, a cone, εἶδος, likeness). A geometrical solid, formed by the motion of a parabola or of a hyperbola round its axis. Conoids vary in thickness in comparison with their height, according to the proportions of the parabola, or hyperbola, by which they are generated. The spheroids, sometimes included in the class of conoids, are more usually limited to the *paraboloid* and the *hyperboloid*. The term conoid is sometimes used synonymously with spheroid, although the latter has no resemblance to single cones, and but little to double ones.

CO′NSEQUENT. In Logic, that part of a conditional proposition which depends on the other. By *consequence* is meant the connexion between the antecedent and the consequent of a conditional proposition.

CO′NSONANCE (*consono*, to sound together). A term applied, in Music, to a combination of harmonious sounds. See *Chord*.

CONSTELLA'TION (*cum*, with, *stella*, a star). A group of stars, designated by the name of some man or lower animal. The several stars of a constellation are distinguished, in the order of their brilliancy or apparent magnitude, by the letters of the English and Greek alphabets, by the ordinal numbers, &c. Forty-eight of the constellations are of unknown antiquity; the twelve which occupy the zodiac are termed the *twelve signs*.

CO'NTINENT (*contineo*, to hold together). A space of land of vast extent, surrounded by water. The *Old Continent* includes the three divisions of Europe, Asia, and Africa, and is so named from its having, till the discoveries of Columbus, in 1492, been the only one known to Europeans. The *New Continent* includes North and South America.

CONTI'NGENT. A term applied in Logic to the matter of a proposition when the terms of it in part agree, and in part disagree.

CONTRACTI'LITY (*contraho*, to draw together). The property by which a body contracts; by which a fibrous tissue returns to its former dimensions after being extended; by which the muscular fibre shortens itself on the application of a stimulus. The last exhibition of this property is usually called *irritability*.

CONTRADIC'TORY PROPOSITIONS. Propositions which, having the same terms, differ both in quantity and quality. *Contrary propositions* are two universals, affirmative and negative, with the same terms.

CON'TRARY TERMS. In Logic, those terms which, coming under some one class, are the *most* different of all that belong to that class; as "*wise*" and "*foolish*."

CONVE'CTION (*conveho*, to carry). A mode of communication of heat through fluid bodies. A portion of water or of air being heated above, or cooled below, the surrounding portions, expands or contracts in magnitude, and thus becoming specifically lighter or heavier, rises or sinks accordingly, *carrying* with it the newly acquired temperature, whatever that temperature may be.

CONVERGENT; DIVERGENT. In Algebra, an indefinite series of terms which continually diminish, so that no number of them, added together, will equal a given number, is said to be *convergent*, as $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} +$ &c. But, when such a number of them can be added together as will surpass any given number, the series is called *divergent*, as $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} +$ &c.

CONVE'RSION. In Logic, a proposition is said to be *converted*, when its terms are *transposed; i. e.* when the subject is made the predicate, and the predicate the subject: when nothing more is done, this is called *simple* conversion. No conversion is employed for any logical purpose, unless it be *illative; i. e.* when the truth of the converse is implied by the truth of the proposition given; *e. g.*, "No virtuous man is a rebel, *therefore* no rebel is a virtuous man."

In Geometry, the term *conversion* denotes a mode of changing the order or magnitude of proportionals, so that they continue still to be proportionals. Thus, of four proportionals, the first is to its excess above the second, as the third to its excess above the fourth.

CONVOLVULA'CEÆ. The Bindweed tribe of Dicotyledonous plants. Herbaceous plants with *leaves* alternate; *flowers* regular, monopetalous; *stamens* inserted into the base of the corolla; *ovarium* superior 2-4 celled; *seeds* albuminous.

CO-O'RDINATES (*con*, together, *ordino*, to arrange). A term applied in Geometry to a system of lines, to which points under consideration are referred, and by means of which their position is determined. In plane geometry one of these lines is called the *abscissa*, the other the *ordinate*.

COPAHU'VIC ACID. A name applied to the resin of copaiva, said to possess the same composition as colophony.

CO'PAL. This substance, erroneously called *gum copal*, is the concrete juice of the Hymenæa Courbaril; it is used as a varnish, and known by the names of *jatahy* and *jatchy*. The copal of the Mexicans is supposed to be procured from a species of Icica.

COPE'PODA. An order of the entomostracous Crustacea, which have the body divided into distinct rings, but without carapace, and the appendages to the mouth in considerable numbers. The animals of this order are commonly termed *monoculous*, from the two eyes being united in one mass.

COPE'RNICAN SYSTEM. A system of Astronomy, so named from Nicholas Copernicus, who was born A.D. 1473, at Thorn in Prussia. He taught, as Pythagoras had taught before him, *that the sun occupied the centre of the universe,* *and that the planets moved round him* in elliptical orbits proportioned to their size. This system was established by the new arguments and discoveries of Galileo, Kepler, and Newton. The great principle on which it rests is gravity, or that force in nature by which all the planets are *attracted to the centre* of their respective orbits.

COPPER (*Cuprum*, quasi *æs Cyprium;* from the island Cyprus, where it was first wrought). A red metal found in the common ore called *copper pyrites.* Among its compounds are *red copper*, or the protoxide; *black copper*, or the peroxide; *copper glance*, or the protosulphuret; *resin of copper*, the protochloride or white muriate; and the *white copper* of the Chinese, an alloy of copper, zinc, nickel, and iron.

CO'PPERAS. Sulphate of iron, or green vitriol. See *Vitriol.*

COPPERNICKEL. A native arseniuret of nickel, a copper-coloured mineral of Westphalia.

CO'PROLITE (κόπρος, dung, λίθος, a stone). The petrified fæcal matter of carnivorous reptiles, resembling an oblong pebble or a kidney potato, and found at Lyme Regis in Dorsetshire.

CO'PULA. In Logic, that part of a proposition which affirms or denies the predicate of the subject; viz., *is*, or *is not*, expressed or implied.

COR CA'ROLI. A modern northern constellation, consisting of three stars.

COR HYDRÆ. A star of the first magnitude in the southern constellation Hydra.

COR LEO'NIS. Another name for Regulus, a star of the first magnitude in the constellation Leo.

COR SCORPIO'NIS. Another name for Antares, a star of the first magnitude in the zodiacal constellation Scorpio.

CORACI'INÆ (*coracias*, the roller). Coraciine Birds, or Rollers; a family of the *Excurtrices* of Macgillivray, the *Insessores* of other writers, indigenous in warm climates, and for the most part gaudily coloured.

CORAL RAG. A subdivision of the middle Oolitic formation, named from its containing abundant remains of corals of various kinds.

CORAL RED. The calcareous internal skeleton of a polypipherous animal, consisting of carbonate of lime, coloured with oxide of iron, and animal matter.

CORALLI'DÆ (*corallum*, coral). *Corallicolæ.* A family of compound polyps, yielding the substance called *coral*, and constituting the third order of the class Polypi.

CO'RALLINE DEPOSITS. In Geology, a designation of those recent or alluvial strata, which consist of the marine banks, shoals, and islands, entirely composed of corals.

CO'RCULUM (dim. of *cor*, the heart). The embryo, or vital principle of a seed, so named from its frequent resemblance, in form, to a *little heart.* It consists of two parts, the *rostellum*, or radicle, which elongates downward to form a root; and the *plumula*, or feather, which lengthens upward to form a stem and leaves.

CO'RDATE (*cordatus*, from *cor*, a heart). Heart-shaped; having two rounded lobes at the base, as applied to certain leaves.

CORIA'CEOUS (*corium*, hide). That which has the texture of rough skin, as the leaves of prunus laurocerasus.

CO'RMUS. The dilated base of the stem of monocotyledonous plants, intervening between the roots and the first buds, and forming the reproductive portion of the stem in acaulescent plants. It occurs in colchicum, in crocus, &c.

CO'RNEOUS (*cornu*, a horn). Horny; resembling the colour or substance of horn, as the epidermis of some, and the operculum of other, spiral shells; the albumen of many plants, &c.

CO'RNEULE. A diminitive of *cornea;* a term applied to the minute transparent segments which defend the compound eyes of insects.

CORNI'CULATE (*corniculum*, a little horn). Horned; terminating in a horn-like process, as the fruit of trapa bicornis.

CORNU AMMO'NIS. An old Latin name for the fossil shell, commonly called ammonite, from its fancied resemblance to the horn with which the head of Jupiter Ammon was sculptured. See *Ammonite.*

CORNU'BIANITE. A slaty rock abundant in the western part of Cornwall, in contact with granite. It is of a dark blue or purple colour, uniform, striped or patched, hard and laminated.

CORO'LLA (dim. of *corona*, a crown). Literally, a little crown. The internal envelope of the floral apparatus. Its separate pieces are called *petals;* when these are distinct from each other, the corolla is termed *poly-petalous;* when they cohere, *gamo-petalous*, or incorrectly *mono-petalous*. A petal, like a sepal, may be *spurred*, as in violet. Compare *Calyx*.

CO'ROLLARY. A corollary to a geometrical proposition is a statement of some truth, which is an obvious consequence of the proposition. The term is derived from the Latin *corollarium*, a reward given to actors, champions, or fencers, above their due.

CORO'NA AUSTRA'LIS et BOREA'LIS. The Southern Crown and the Northern Crown; two of the old constellations of Ptolemy, the former in the southern, the latter in the northern hemisphere.

CO'RONATED (*corona*, a crown). Crowned; a term applied to spiral shells which have their whorls more or less surmounted by a row of spines or tubercles, as in the typical volutes, several cones, mitres, &c.

CORPU'SCULAR THEORY (*corpusculum*, a little body). A theory for explaining the nature of light. According to this, the sun and all other luminous bodies have the property of emitting *corpuscles*, or exceedingly minute particles of their substance, with prodigious velocity. Hence it has been also termed the Theory of Emission. See *Undulatory Theory*.

CORRO'SIVE SUBLIMATE. The bichloride, formerly called the oxymuriate, of mercury.

CO'RRUGATE (*cum*, with, *ruga*, a wrinkle). Wrinkled; folded up in every direction, as in the æstivation of the poppy.

CORTI'NA. A curtain; a name given to a portion of the velum of fungaceous plants, which adheres to the margin of the pileus in fragments.

CORU'NDUM. A stone found in India and China; it crystallizes in six-sided prisms, which, from their hardness, are termed *adamantine spar*. The amethyst, ruby, sapphire, and topaz, are considered as varieties of this spar, differing from one another chiefly in colour. These are termed *Oriental* gems; but the names are applied to stones of other countries. Jameson distinguishes three species of corundum, the *octohedral*, the *rhomboidal*, and the *prismatic* or chrysoberyl.

CORVI'DÆ (*corvus*, a crow). Corvine birds, or Crows; a family of the *Insessores*, or of the *Excurtrices* of Macgillivray, including the crow, the raven, the magpie, the jay, and other conirostral birds.

CORVUS. The Crow; a southern constellation, consisting of nine stars, the principal of which is Algorab. It is sometimes called *Hydra et Corvus*, the Corvus resting on part of the body of Hydra.

CORY'DALINE. A vegeto-alkali, found in the root of Corydalis bulbosa and fabacea.

CORYLA'CEÆ. The Nut tribe of Dicotyledonous plants, named from the genus *corylus*, and comprising the oak, the beech, the hazel, the hornbeam, and the sweet chestnut. See *Cupuliferæ*.

CO'RYMB. A form of inflorescence, in which the lower stalks are so long that their flowers are elevated to the same level as that of the uppermost flowers. The expansion of the flowers of a corymb is centripetal. See *Fascicle*.

CO'RYMBOSE. That arrangement of the ramifications of plants, in which the lower branches or pedicles are so long as to bring the leaves or flowers to the same level as that of the upper ones.

CO-SECANTS, CO-SINES, CO-TANGENTS. These are the *secants*, *sines*, and *tangents*, of arcs which are the complements of those in question. See *Trigonometry*.

CO'SMICAL (κόσμος, the universe). A term opposed to *acronychal*, and, as such, denotes the rising or setting of a star in the morning at the moment of sunrise. The cosmical and acronychal risings of a star are invisible to the naked eye, because the light of the sun in the horizon effaces that of the star. See *Heliacal*.

COSMO'GRAPHY (κόσμος, the universe, γράφω, to describe). A description of the system of the universe; a term differing from Geography, as a whole differs from its part. The term should be distinguished from *cosmogony* (γονὴ, generation), which relates to the origin and creation of the world; and from *cosmology* (λόγος, account), which treats of the metaphysical philosophy of the constitution of the world.

CO'TTON (*kutun*, Arab.). The hairy covering of the seeds of several species of *Gossypium*. The cotton-plant must not be confounded with the cotton-tree (*Bombax*), the cotton of which cannot be manufactured.

COTYLE'DON (κοτυληδὼν, a cavity). The seed-lobe of a plant. Plants have been distinguished, with reference to the number of their cotyledons, into *dicotyledonous*, or those which have two cotyledons in their seeds; *mono-cotyledonous*, or those which have only one; and *a-cotyledonous*, or those which have none.

COUCH. The heap of moist barley, about 16 inches deep, on the malt-floor.

COU'MARIN. A neutral substance, extracted from the tonka bean, the fruit of the *Coumarouna* odorata, and the flowers of the melitot.

COU'NTERPOINT (*contra punctum*, point against point). A term in Music, synonymous with *harmony*, and derived from the old method of placing the stemless *points*, or notes, *against* or over one another, in compositions of two or more parts.

COURONNE DE TASSES. Literally, a crown or circle of cups. An apparatus employed in voltaic electricity, consisting of a circle of cups containing salt water, and connected together by compound metallic arcs of copper and zinc.

COU'ZERANITE. A mineral found in limestone, in the deep defiles of Saleix called *des Couzerans.*

CRA'CIDÆ (*crax*, a curassow). The Curassows; a group of the *Rasores*, or Scratching birds, the legs of which are unarmed with spurs, and the hind toe so much developed, as to give them considerable power in perching.

CRAG. A provincial term in Norfolk and Suffolk for certain tertiary deposits usually composed of sand with shells, belonging to the older pliocene period.

CRANIO'SCOPY (*κρανίον*, the skull, *σκοπέω*, to investigate). An investigation of the skull. Dr. Prichard has characterized the primitive forms of the skull according to the width of the *bregma*, or space between the parietal bones: hence—

1. The *steno-bregmate* (*στενὸς*, narrow), or Æthiopian variety.
2. The *meso-bregmate* (*μέσος*, middle), or Caucasian variety.
3. The *platy-bregmate* (*πλατὺς*, broad), or Mongolian variety.

CRANK. A mechanical contrivance for converting a revolving into an alternate motion.

CRASSULA'CEÆ. The House-leek tribe of Dicotyledonous plants, named from the genus *crassula.* Succulent herbs or shrubs, with showy *flowers* usually in cymes, *sepals* from 3 to 20, *petals* distinct or cohering, *stamens* inserted with the petals, *fruit* of several follicles, opening on their face.

CRA'TER (*crater*, a large cup or bowl). The circular cavity at the summit of a volcano, from which the volcanic matters are ejected. Besides the *craters of eruption*, more extensive craters are supposed to have been formed by the elevation of the ground previous to volcanic eruptions, and are therefore called *craters of elevation.*

CRATER (in Astronomy). The Cup, a southern constellation consisting of thirty-one stars.

CREMOCA'RPIUM (*κρεμάω*, to suspend, *καρπός*, fruit). In Botany, a compound fruit, 2-5-celled, inferior; cells 1-seeded, indehiscent, dry, perfectly close at all times; when ripe, separating and hanging from a common axis. Mirbel restricts the term to the fruit of Umbelliferæ. See *Polakenium.*

CRENA'TED (*crena*, a notch or slit). A term applied to shells, which present small indentations, generally of a sharp and regular form, frequently observed on the outer lip of spiral shells, particularly on many of the typical mitres. A leaf is said to be *crenelled*, when its margin has rounded toothings or teeth.

CRE'OSOTE (*κρέας*, flesh, *σώζω*, to preserve). *Kreasote.* An oily, colourless, transparent liquid, discovered first in pyroligneous acid, and subsequently in the different kinds of tar. Its name is derived from its preventing the putrefaction of meat or fish, when dipped in it.

CREPITA'TION (*crepito*, to crackle). The crackling noise occasioned by pressing cellular membrane which contains air; also the sound emitted by certain salts during calcination.

CREPU'SCULARIA (*crepusculum*, the twilight). The twilight-moths, or Hawkmoths; a tribe of *Lepidopterous* insects, corresponding with the Linnæan genus *Sphinx*, and named from their general habit of flying only in twilight.

CRETA'CEOUS SYSTEM (*creta*, chalk). A geological series of rocks, in which calcareous matter forms the predominating mass, to which the flints and other extraneous minerals are subordinate. Part of it seems to have been deposited in a sea of considerable depth, and all of it is marine. In a general sense, it is distinguished into the Green Sand and the Chalk Formations.

CRI'CHTONITE. A mineral found associated with anatase, and on rock crystal, in Dauphiny.

CRINOI'DEA (*κρίνον*, a lily, *εἶδος*, like). A term applied to a tribe of

Echino-dermatous animals which resemble lilies, of which the fossils called *stone-lilies* and *encrinites* are examples. The fossil remains called *trochi* and *St. Cuthbert's beads* are separated portions of the earthy framework of encrinites.

CRITICAL PHILOSOPHY. A term sometimes applied to the metaphysical system of Kant from his famous work entitled "Criticism of Pure Reason."

CROCO'NIC ACID (*crocus*, saffron). An acid derived from carbonic oxide, and named from the saffron colour of its salts, called *croconates*.

CROCUS (κρόκος). Saffron. An old term applied to *oxides* and other preparations of the metals, from their *saffron* colour: thus we have *crocus martis*, or oxide of iron; *crocus metallorum*, or oxide of antimony; *crocus Veneris*, or oxide of copper.

CROP, or CRAW. A sort of preliminary stomach in some birds, formed by an expansion of the œsophagus. Compare *Gizzard*.

CROP OUT. A technical term, to denote the rising up, or exposure at the surface, of a stratum or series of strata.

CROSS-STONE. Harmotone, or pyramidal zeolite, found in mineral veins and agate balls.

CROTA'LIDÆ (*crotalus*, a rattlesnake). A family of Ophidian reptiles, including the Rattlesnakes and the Vipers, and all the venomous species. They are distinguished from the Colubeнridæ principally by the character of the teeth.

CROTCHET. In Music, a character constituting the fourth part of a semibreve; its duration, in slow time, is about one second.

CROTO'NIC ACID. *Iatrophic acid.* A solid, volatile, and highly poisonous acid derived from croton oil, the fat oil of the seeds of *Croton tiglium*.

CRU'CIATE (*crux, crucis*, a cross). A designation of the corolla of cruciferous plants, from the resemblance of the arrangement of the petals to the pieces of a Maltese cross.

CRU'CIBLE. An earthern vessel in which substances are exposed to high temperatures. The term is derived either from *crux*, a cross, which the alchemists stamped upon the vessel; or from *crucio*, to torture, because the metals were *tortured* in crucibles, in order to convert them into gold.

CRUCI'FERÆ (*crux, crucis*, a cross, *fero*, to bear). The Cruciferous tribe of Dicotyledonous plants. Herbaceous plants with *leaves* alternate; *flowers* polypetalous; *sepals* 4, deciduous, cruciate, alternating with 4 cruciate petals; *stamens* 6, hypogynous, tetradynamous; *fruit* a siliqua or a silicula.

CRUST OF THE EARTH. The superficial parts of our planet which are accessible to observation.

CRUSTA. A term applied to the brittle crustaceous thallus of lichens; to the bony covering of the crab, the lobster, &c.

CRUSTA'CEA (*crusta*, a shell). A class of articulated animals with an exterior shell which is generally hard and calcareous, and is cast off periodically, as in the crab, the shrimp, the lobster, &c.

CRUX. The Cross; a southern constellation, situated close to the hinder legs and under the body of Centaurus.

CRY'OLITE (κρύος, frost, λίθος, a stone). A mineral consisting of the double hydrofluate of alumina and soda, occurring in gneiss. The term is derived from the property which this mineral presents of fusing readily in the flame of a candle.

CRYO'PHORUS (κρύος, cold, φέρω, to bring). An instrument for exhibiting the degree of cold produced by evaporation. The term denotes *frost-bearer*, and it is well illustrated by the Cryophorus of Wollaston, which consists of two hollow glass balls connected by a bent glass tube, one of them containing water; the *cold is transferred* from one ball to the other.

CRY'PTA (κρυπτὸς, concealed). *Glandulæ impressæ.* A term applied to the vesicular receptacles of oil found in the leaves of the orange and of all myrtaceous plants.

CRYPTOBRANCHIA'TA (κρυπτὸς, concealed, βράγχια, gills). A designation of those molluscous and articulate animals, which have no conspicuous gills.

CRYPTOGA'MIA (κρυπτὸς, concealed, γάμος, nuptials). A class of plants, including ferns, mosses, sea-weeds, &c., in which the fructification, or organs of reproduction, are concealed. These are also called agamous, acotyledonous, and cellular plants. See *Phanerogamia*.

CRYPTO'GRAPHY (κρυπτὸς, secret, γράφω, to write). The art of writing in a secret manner, as in cypher. See *Cypher*.

CRYPTONEU'RA (κρυπτὸς, concealed, νεῦρον, a nerve). A term applied by Rudolphi to those radiate animals in which no nervous filaments or masses have been discovered. They correspond with the *Acrita* of Macleay, and the Protozoa and Oozoa of other writers.

CRY'STAL (*κρύσταλλος*, ice). A solid body of a limited symmetrical form, included by plane surfaces. In organized bodies *spherical* forms predominate, whilst unorganized bodies are mostly *angular*. Quartz, being often found in a crystalline form, and being transparent like ice, was called *rock-crystal;* and hence all other minerals of regular forms are called *crystals*, whether they be clear or opaque.

1. The *structure of a crystal* is the arrangement of its component parts, and this is ascertained by splitting it in the direction of its *planes of cleavage;* the crystal is thus obtained in its *primitive form*, and, when this differs from the figure at first presented by the body, the latter is called the *secondary form.*

2. *Primitive Forms.* By the term "primitive form," Haüy designates the *nucleus* of crystals; "secondary forms" are varieties which differ from the primitive form. The primitive forms of crystals are the tetrahedron, the parallelopipedon, the octohedron, the hexagonal prism, the rhombic dodecahedron, and the dodecahedron with triangular faces. To the parallelopipedon belong the cube and the rhombohedron.

3. The angles at which the edges of the planes or faces of a crystal meet, are called *plane angles;* and the point formed by the union of three or more of these, a *solid angle.* The lines which join these points, and pass through the middle of the crystal, are called its *axes;* there are usually three of these, a *principal* axis, and two *secondary* or *subordinate axes.*

4. In the Wernerian language of crystallization, the following terms are employed:—When a secondary form differs from the cube, the octohedron, &c., only in having several of its angles or edges replaced by a face, this change of the geometrical form is called a *truncation.* The alteration in the principal form produced by two new faces inclined to one another, and which replace, by a kind of bevel, an angle or an edge, is called a *bevelment.* When these new faces are to the number of three or more, they produce what Werner termed a *pointing* or *acumination.* When two faces unite by an edge in the manner of a roof, they have been called *culmination.* The term *replacement* is occasionally used for *bevelment.*

CRYSTAL ELECTRICITY. A term sometimes applied to *thermo-electric polar tension*, from its being displayed principally in crystallized substances, especially in those which belong to the mineral kingdom. The crystals which exhibit this property are termed *thermo-electric crystals*, as tourmaline.

CRYSTALLINE LENS. A thick compact humour, in form of a flattish convex lens, situated in the middle of the eye, and causing that refraction of the rays of light which is necessary to make them meet in the retina, and form an image thereon, whereby *vision* is performed.

CRYSTALLIZA'TION (*κρύσταλλος*, a crystal). The process by which the particles of liquid or gaseous bodies form themselves into *crystals*, or solid bodies of a regularly limited form.

Crystallization, Alternate. This term is applied to a phenomenon which takes place when several crystallizable substances, having little attraction for each other, are present in the same solution. That which is largest in quantity and least soluble crystallizes first, *in part;* the least soluble substance next in quantity then begins to separate; and thus different substances, as salts, are often deposited in successive layers from the same solution.

CRYSTALLO'GRAPHY (*κρύσταλλος*, a crystal, *γράφω*, to describe). The science which investigates the relation of crystalline forms, and the origin and structure of crystals.

CTE'NOBRANCHIA'TA (*κτεὶς*, a comb, *βράγχια*, gills). A term synonymous with *Pectinibranchiata*, applied to an order of Gasteropods which breathe by means of pectinated gills.

CTENOI'DES (*κτεὶς*, a comb, *εἶδος*, likeness). An order of fishes, furnished with scales composed of layers with pectinated or toothed posterior margins.

CU'BATURE. The measurement of the contents of a solid body, or the finding a cube equal to it.

CUBE (*κύβος*, a cube). A geometrical solid, contained by six equal squares. It is the measuring unit of solid content, as the square is that of superficial extent, or area.

CUBE ORE. Hexahedral Olivenite, or Wurfelerz; a green mineral, which occurs crystallized in a perfect cube, in Cornish mines, accompanied with iron-shot quartz. It is an arseniate of iron.

CUBIC EQUATION. An equation

which involves the *cube*, or third power of the unknown quantity. Like equations of any other degree, cubic equations are either *pure* or *adfected.*

CUCULI'DÆ (*cuculus*, a cuckoo). The Cuckoo tribe; a family of the *Scansores*, or Climbing birds, characterized by the short and slender structure of the feet, and by their migratory habits. Macgillivray places them next to the goat-suckers, from the great similarity of their digestive organs. They are little capable of walking, and belong to a group, of which the habit is to perch on trees or shrubs, whence they glide after passing insects.

CUCU'LINÆ. A family of bees which, having no femoral plates for transporting pollen, resort to the combs of other bees in order to deposit their eggs—a habit resembling that of the *cuculus*, or cuckoo.

CUCU'LLATE (*cucullus*, a hood). Hooded; having the apex and sides curved inward, as the upper sepal of aconite.

CUCURBITA'CEÆ (*cucurbita*, a gourd). The Gourd tribe of Dicotyledonous plants. Climbing plants with *leaves* palmated, succulent; *flowers* unisexual, monopetalous; *stamens* cohering in three parcels; *ovarium* inferior; *fruit* fleshy; *seeds* flat; *testa* coriaceous.

CUDBEAR. A neutral colouring matter, prepared from the *Leconora tartarea* and other lichens, and named from Sir Cuthbert Gordon. The Germans call it *persio.*

CULI'CIDÆ (*culex*, a gnat). The Gnat tribe; a family of Dipterous insects, belonging to the section Nemocera, distinguished by their beautifully tufted antennæ.

CULM. The peculiar stem of grasses, sedges, &c. Also, a provincial synonym of *anthracite.*

CULMINA'TION (*culmen*, the top of any thing). The transit or passage of a star over the meridian, or the point of its highest altitude.

CU'MBRIAN GROUP. A group of rocks constituting the lower series of the Clay-slate system, upwards of 3000 feet in thickness, and comprising the hornblendic clay-slate, chiastolite-slate, and clay-slate.

CUMULO'STRATUS. The *twain-cloud;* a composite modification of clouds, known by its generally flat base, with a superstructure resembling a bulky cumulus overhanging the base in large fleecy protuberances, or rising into the forms of rocks and mountains. The Latin term is derived from the frequent grouping of considerable *cumuli*, or masses, upon a common *stratum*, or base; the English term, from the frequently visible coalescence of two other modifications, viz. the cirrus and the cumulus. This cloud may always be regarded as a stage towards the production of rain or snow, and, in this case, it always ends in the nimbus.

CU'MULUS (Lat. a heap). The *stacken-cloud;* a primary form of clouds, known by its irregular hemispherical or heaped superstructure, and usually flattened base. It is formed by the gathering together of detached clouds, which then appear *stacked* into one large and elevated mass. It may be called the *cloud of day*, as it usually exists only during that period.

CUMY'L. The compound radical of a series of compounds procured from the seeds of the *Cuminum Cyminum.*

CU'NEIFORM (*cuneus*, a wedge, *forma*, likeness). *Cuneate.* Wedge-shaped; inversely triangular, with rounded angles; a shape characteristic of certain bivalves, analogous to the clavate form among univalves.

Cuneiform Letters. A term applied to the inscriptions found on old Babylonian and Persian monuments, from the characters being formed like a wedge.

CUPEL (*kuppel*, German). A small flat *cup*-like crucible, made of bone ash, used in the assays of the precious metals, which are fused on a cupel with lead.

CUPELLA'TION. The process of purifying gold and silver by melting them with lead, which becomes first oxidated, then vitrified, and sinks into the *cupel*, carrying along with it all the baser metals, and leaving the gold or silver upon its surface.

CU'PULA. A form of involucrum, occurring in the oak, the beech, the hazel; and consisting of bracts not much developed till after flowering, when they cohere by their bases, and form a kind of *cup.*

CUPULI'FERÆ (*cupula*, a small cup). The Oak tribe of Dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* amentaceous, diœcious, apetalous; *ovarium* inferior, inclosed in a cupule; *fruit* a horny or coriaceous nut.

CU'RCUMA PAPER. Paper stained with a decoction of *turmeric*, and employed by chemists as a test of free alkali, by the action of which it receives a brown stain.

CU'RCUMINE. The colouring matter of turmeric, obtained in a state of purity by separating it from its combination with oxide of lead.

CURD. The coagulum which separates from milk, upon the addition of acid, rennet, or wine.

CURRENTS, ATMOSPHERIC. Disturbances of the atmospheric mass from regular or accidental causes. 1. *Regular* or *periodical currents* are the trade-winds, monsoons, sea and land breezes, which are caused by the rotatory motion of the globe being greater than that of the air, by the combined attraction of the sun and moon producing tides in the atmosphere, &c. 2. *Irregular currents* are ordinary winds, produced by variations of temperature or of electrical distribution, and have frequently a circular or rotatory motion.

CURRENTS OF THE SEA. Certain motions of the sea, which are independent of the tides, and named drift-currents and stream-currents.

1. *Drift-currents* are motions produced on the surface of the sea by the perpetual or the prevailing winds. Thus, in the Atlantic Ocean, a drift-current occurs between the tropics, where it is produced by the trade-wind; other drift-currents occur to the north and the south of 30°, where they are ascribed to the effects of the prevalent winds.

2. *Stream-currents* are motions produced to a great depth, perhaps to the bottom, of the sea; their causes are consequently unknown. Amongst these may be noticed the *equatorial current*, running from the coast of Africa to that of South America; and the *gulf-stream*, flowing from North America to the shores of Europe.

CURRENTS, SUBTERRANEAN. Subterranean currents of water, supposed to be the cause of the formation of caverns in limestone districts by gradually wearing away the rock in the course of fissures.

CURSO'RES (*cursus*, a course). Coursers; an order of birds, so named from their remarkable velocity in running. They were included by Cuvier in the *Grallatores*, or Waders, probably on account of the length of their legs. They comprise the ostrich, the cassowary, the emu, the apterix, and the dodo. These birds exhibit the nearest approach to the Mammalia.

Under the term *Cursores*, Walcknäer arranges those spiders which make no webs, but catch their prey by swift pursuit.

CURSO'RIA (*cursus*, a course). A family of *Orthopterous* insects, the legs of which are all alike, and adapted for running. They include the ear-wig, the cockroach, and the mantis. See *Saltatoria.*

CU'RTATE (*curtatus*, shortened). A term sometimes applied, in Geometry or Astronomy, to a line projected orthographically upon a plane.

Curtate Distance, in Astronomy, denotes a planet's distance from the sun, reduced to the plane of the ecliptic.

CURVE (*curvus*, bent). A term applied to a line of which no portion, however small, is straight. A *crooked* line may be either a curved line, or the junction of two or more straight lines drawn in different directions. The principal curves are the circle, the ellipse, the parabola, the hyperbola, and the cycloid.

1. *Curve, Algebraic and Transcendental.* 1. Algebraic curves are those in which the relation between the abscissa and the ordinate is expressed by an algebraic equation. 2. Transcendental curves are those in which the relation between x and y is not expressed by an algebraic, but by a differential equation; that is, by an equation between dx and dy.

2. *Curve, Evolute and Involute of.* If a thread, having one of its ends fixed, be wound round a curve, this primary curve is called the *evolute.* If the thread, thus tightly applied upon the convexity of the curve, be then unwound, it will describe a secondary curve at the back of the former, termed the *involute.* It will be seen that the thread, at every point of unwinding, is a tangent to the evolute.

3. *Curve, Equation of.* An algebraic expression, pointing out the relation between the *ordinate* and the *abscissa.* In every conic section, these two lines are at right angles to each other; and at whatever point of the axis (in the same sort of curve) the ordinate may be drawn, these two lines will always have the same relation to each other.

4. *Curves of Double Curvature.* Curves traced on surfaces which are not plane: a double curvature thus arises, viz. that belonging to the line itself, and that of the surface on which it is traced.

5. *Curve Surfaces.* A curve surface is represented algebraically by an equation containing three variables, as x, y,

and z. It is geometrical when its equation is algebraic, and expressed in finite terms; and mechanical, when the equation is not algebraic, but differential.

CUSP (*cuspis*, a point). In Geometry, the point where two parts of a curve meet and terminate. In Astronomy it denotes the tip or horn of the crescent of the moon. In an eclipse of the sun, the borders of the sun and moon make two cusps at their point of intersection.

CU'SPIDATE (*cuspis*, a spear). Spear-shaped; tapering to a stiff point; abruptly acuminate; a term applied to leaves.

CU'TICLE (dim. of *cutis*, skin). In Botany, a thin homogeneous membrane, external to the epidermis, formed of organic mucus, and overlying every part of plants, except the stomates and the stigmatic tissue.

CY'ANIC ACID. A volatile, corrosive acid, procured from cyanogen, existing only in combination. It is converted spontaneously into a white solid matter called *cyamelide*.

CY'ANITE (*κύανος*, blue). *Disthene.* A mineral occurring in the granite and mica-slate of primitive mountains, and used in India as an inferior kind of sapphire. Its principal colour is Berlin-blue, which passes into grey and green.

CY'ANO- (*κύανος*, blue). A Greek term, denoting a clear bright blue colour.

CYAN'OGEN (*κύανος*, blue, *γεννάω*, to generate; so called from its being an essential ingredient in Prussian blue). Bi-carburet of nitrogen; a gas. It forms, with oxygen, the *cyanic*, *cyanous*, and *fulminic acids;* and with hydrogen, the *hydro-cyanic*, or *prussic*. All its compounds, which are not acid, are termed *cyanides* or *cyanurets*.

CYANO'METER (*κύανος*, blue, *μέτρον*, a measure). An instrument invented by Saussure, for comparing the different shades of blue in order to determine the deepness of the tint of the atmosphere.

CY'ATHIFORM (*cyathus*, a drinking-cup, *forma*, likeness). Cup-shaped; as applied to the form of certain corollas.

CYCADA'CEÆ. A family of Gymnospermous plants, named from the genus *cycas*, and consisting of trees, with a cylindrical trunk, increasing by a single terminal bud.

CYCLE (*κύκλος*, a circle). A certain period of time, in which the same revolutions begin again; a periodical space of time.

1. *Cycle of the Sun.* A revolution of twenty-eight years, at the expiration of which the days of the months return again to the same days of the week; the sun's place to the same signs and degrees of the ecliptic on the same months and days, so as not to differ one day in 100 years; and the same order of Leap-years and of Dominical Letters returns; hence it is also called the *Cycle of the Sunday Letter*.

2. *Cycle of the Moon.* A revolution of nineteen years, after which the various aspects of the moon are, within an hour, the same as they were on the same days of the month nineteen years before. This cycle was adopted on the 16th of July, B.C. 433, by Meton, whose name it also bears.

3. *Cycle, Paschal.* The cycle of the Sun consists of twenty-eight, and the cycle of the Moon of nineteen years; these cycles, multiplied by each other, form a third, which is called the *Paschal Cycle*, because it serves to ascertain when Easter occurs. At the end of a revolution of 532 years, the two Cycles of the Moon, the Regulars, the Keys of the Moveable Feasts, the Cycle of the Sun, the Concurrents, the Dominical Letters, the Paschal Term, Easter, the Epacts, with the New Moons, recommence as they were 532 years before, and continue the same number of years.

4. *Cycle, Ecliptical.* An unknown period of time during which the angle between the ecliptic and the equator, constituting the obliquity of the ecliptic, has completed all its changes. The present rate of diminution of the obliquity is estimated at about 48 seconds of a degree every century.

CY'CLICA (*κύκλος*, a circle). A section of Coleopterous insects, with bodies of a rounded or oval form. According to Latreille, they constitute a subsection of the section *Tetramera*.

CY'CLINÆ. A sub-family of the Tellinidæ, or Solid and Closed Bivalves, named from the genus *cyclas;* these animals are generally fluviatile, and have their shells covered by an epidermis.

CY'CLOBRANCHIA'TA (*κύκλος*, a circle, *βράγχια*, gills). An order of *Gasteropods*, in which the branchia form a fringe around the body of the animal, between the edge of the body and the foot. The order consists principally of the *limpets*.

CYCLO-GANGLIATA (*κύκλος*, a circle, *γαγγλίον*, a nerve-knot). A term applied by Dr. Grant to the fourth sub-kingdom of animals, or *Mollusca*, comprising animals distinguished by the high development of the cerebral ganglia, and their circular distribution around the œsophagus. These are the *Heterogangliata* of Owen.

CYCLO-NEURA (*κύκλος*, a circle, *νεῦρον*, a nerve). A term applied by Dr. Grant to the first sub-kingdom of animals, or *Radiata*, as expressive not only of the common *circular form* of the nervous axis in this division, but also of its rudimental state of simple *filaments*.

CY'CLOID (*κύκλος*, a circle, *εἶδος*, likeness). A geometrical transcendental curve, described by a point in the circumference of a circle, which rolls along a plane until it has completed a revolution. Thus the nail on the felly of a wheel moves in a cycloid, as the carriage goes along, and as the wheel itself both turns round its axle and is carried along the ground.

When the tracing point is placed *without* the circle, the curve has its base shortened, and is called the *curtate* or *contracted cycloid.* If the point is *within* the circumference, the curve is called the *prolate* or *inflected cycloid.*

CYCLO'SIS (*κύκλος*, a circle). A circular movement of the globular particles of the sap, as observed in the cells of Chara and Nitella, and in the jointed hairs projecting from the cuticle of several other plants. A similar motion has been recently found by Mr. Lister to exist in a great number of Polypiferous Zoophytes.

CYCLO'STOMI (*κύκλος*, a circle, *στόμα*, a mouth). An order of *Chondropterygious* or Cartilaginous Fishes, having a round fleshy lip, by which they adhere to their prey, obtaining their food by suction, as in the lamprey. The lip is supported by a cartilaginous ring, formed by the union of the jaw-bones. In fishes of this order the vertebrated structure is found in its lowest form.

CYGNUS. The Swan; a northern constellation containing eighty-one stars, the principal of which is Dereb Adige.

CY'LINDER (*κύλινδρος*, a cylinder). A geometrical solid, with a circular base, described by the revolution of a right-angled parallelogram about one of its sides, which remains fixed. It is a circular prism, as a cone is a circular pyramid. The *axis* of a cylinder is the fixed straight line about which the parallelogram revolves. When the base is elliptical, the solid is a *cylindroid;* when the sides are perpendicular to the base, it is a *right cylinder* or cylindroid; in other cases it is an *oblique cylinder.*

CYLINDRE'NCHYMA (*κύλινδρος*, a cylinder, *ἔγχυμα*, infusion). A designation given by Morren to the cylindrical variety of the parenchyma of plants.

CYM'BIFORM (*cymba*, a boat, *forma*, likeness). Navicular, or boat-shaped, as applied to the glumes of certain grasses, and synonymous with *carinate.*

CYME. A form of inflorescence resembling an umbel and a corymb, but with a centrifugal expansion, indicated by the presence of a solitary flower in the axis of the dichotomous ramifications.

CY'MOPHANE. The designation given by Haüy to *chrysoberyl.*

CY'MOSE. Resembling a cyme, as applied to inflorescences and leafy branches.

CYNARA'CEÆ. A division of the *Compositæ*, named from the genus *cynara*, and comprising plants characterized by intense bitterness, which depends upon the mixture of extractive with a gum which is sometimes yielded in great abundance.

CYNA'RRHODON. In Botany, an aggregate fruit, consisting of distinct ovaries; the pericarps are hard, indehiscent, enclosed within the fleshy tube of a calyx, as in rose, calycanthus, &c. The term is a Greek compound for *dog-rose.*

CYNI'PIDÆ (*cynips*, the gall-fly). The Gall-flies; a family of the entomophagous Terebrantia, which, by means of their ovipositor, form tumors on plants, commonly termed *galls*, nut-galls, or gall apples.

CYPERA'CEÆ. The Sedge tribe of Monocotyledonous plants, named from the genus *cyperus.* These plants resemble grasses in appearance, but have a solid and angular stem, without a diaphragm at the articulations; the flowers grow in the axil of a single bract; and the cotyledonar extremity of the embryo is enclosed *within* the albumen. See *Graminaceæ.*

CYPHE'LLÆ (*κύφελλα*, the hollows of the ears). Pale tubercle-like spots on the *under* surface of the thallus of lichens, as in sticta.

CY'PHER or CIPHER. In common language, to *cypher* is to calculate; and to *write in cyphers* is to write in secret or unknown characters, such as were the Arabic numerals when first introduced into Europe.

CYPRÆ'IDÆ. The Cowries or Porcelain shells; a family of carnivorous *Gasteropods*, named from the typical genus *cypræa;* the shells are without any spire, the last whorl enveloping all the others, as in the bullas.

CYPRI'NIDÆ (*cyprinus*, the carp). The Carp tribe; a family of *Malacopterygious* or soft-spined fresh-water fishes, having the ventral fins placed beneath the abdomen.

CY'PSELA (*κυψέλη*, any hollow vessel). In Botany, the compound fruit of the Compositæ. It is one-celled, one-seeded, indehiscent, with the integuments of the seed not cohering with the endocarp; in the ovarial state evincing its compound nature by the presence of two or more stigmata; but nevertheless unilocular, and having but one ovulum.

CY'PSELINÆ (*cypselus*, a swift). Cypseline Birds, or Swifts; a group of Macgillivray's *Volitatrices* or Gliders, remarkable for the extreme rapidity of their flight and unwearied activity.

CYSTIBRA'NCHIANS (*κύστις*, a bladder, *βράγχια*, gills). A family of Isopodous Crustaceans, comprising those which have the branchiæ lodged in vesicular cavities.

CY'STICA (*κύστις*, a bladder). Cystworms or hydatids; an order of *Entozoa*, which have one or more buccal orifices leading into a terminal cyst.

CYSTI'DIUM (dim. of *κύστις*, a bladder). In Botany, a term employed by Link as synonymous with *utricle*. By the term *cystidia* are denoted the projecting cells, or supposed male organs of agarics, &c.

CY'STULA or CISTELLA. A round closed apothecium in *lichens*, filled with sporules adhering to filaments arranged round a common centre, as in sphærophoron. The term is also applied to the little open cups on the upper surface of the fronds in marchantia.

CYTOBLAST (*κύτος*, a cavity, *βλαστάνω*, to sprout). A nucleus observed in the centre of some of the bladders of the cellular tissue of plants, and regarded by Schleiden as a universal elementary organ.

D

DACTYLO'LOGY (*δάκτυλος*, a finger, *λόγος*, an account). The art of spelling words by placing the fingers in such positions as to signify the letters of the alphabet. Dactylology is to alphabetic writing what this is to speech.

DAGUERRE'OTYPE. A process by which all images produced by the camera obscura are retained and fixed in a few minutes upon surfaces of silver, by the action of light. The name is derived from Daguerre, the inventor.

D'ALEMBERT'S PRINCIPLE. A principle in Mechanics, which may be thus stated:—"If several *non-elastic* bodies have a tendency to motion, with velocities, and in directions which they are constrained to change, in consequence of their reciprocal action on each other, then these motions may be considered as composed of two others; one, which the bodies actually take; and the other such, that, had the bodies been acted on by such alone, they would have remained in equilibrium."

DAMPS. The permanently elastic fluids which are extricated in mines. These are *choke damp*, or carbonic acid; and *fire damp*, consisting almost solely of light carburetted hydrogen, exploding on contact with a light.

DAOU'RITE. *Rubellite*. A variety of red schorl found in Siberia, mixed with white quartz.

DASY'METER (*δασὺς*, dense, *μέτρον*, a measure). A measurer of density; an instrument employed for testing the density of the air. It is used for this purpose instead of a barometer, and is sometimes called a *manometer*.

DA'TA. *Things given*. A term used in Geometry to denote certain things or quantities, which are either actually exhibited, or can be found out; that is, which are either known by hypothesis, or can be demonstrated to be known.

DA'THOLITE. A mineral found in Norway, containing boracic acid, silica, and lime. See *Botryolite*.

DA'TIVE CASE (*dativus*, from *do*, to give). The *giving* case of nouns, known by the signs *to* and *for*, and serving to denote the remoter object *to* which the action of the subject is directed; *for* which, to the benefit or loss of which, something is done.

DA'VITE. A fibrous sulphate of alumina, found in a warm spring near Bogota in Columbia.

DAY. In common language, the interval of time which elapses between the rising and the setting of the sun; this is called an *artificial day*.

1. The *civil day* begins at twelve o'clock at midnight, and lasts till the same hour of the following night. It is counted in two portions of twelve hours each, viz. from midnight to noon, and from noon to the succeeding midnight.

2. The *astronomical* or *solar day* begins at noon, and is counted up to twenty-four hours, terminating at the succeeding noon. This mode of reckoning the day is employed in the Nautical Almanac, and may lead to mistakes with persons not familiar with this mode of computation. Thus, January 10, fifteen hours, in *astronomical time*, is January 11, three in the morning, *civil time*.

3. The *sidereal day* is the time which elapses between that of a star being in the meridian of a place to the moment when it arrives at the meridian again. This period is always the same, not being affected by the motion of the earth in her orbit, as the solar day is. The sidereal day is about four minutes less than the mean solar day.

DEBA'CLE (*débacler*, to unbar, to break up as a river after a long frost). A great rush of waters which, breaking down all opposing barriers, carries forward the broken fragments of rocks, and spreads them in its course.

DE'CAGON (*δέκα*, ten, *γωνία*, an angle). A geometrical figure, having ten sides and consequently ten angles. If the sides and angles are all equal, the figure is a *regular* decagon, and may be inscribed in a circle.

DECAGY'NIA (*δέκα*, ten, *γυνή*, a woman). The designation of those *orders* of plants in the Linnæan system, which are characterized by the presence of ten pistils.

DECA'NDRIA (*δέκα*, ten, *ἀνήρ*, a man). The tenth *class* of plants in the Linnæan system, characterized by the presence of ten stamens.

DECANTA'TION. The act of pouring off clear fluid from sediment, or from suspended impurities,—a method sometimes adopted to avoid the use of filters, which might be destroyed by an acid or alkaline solution.

DECA'PODA (*δέκα*, ten, *πoὺς*, *ποδὸς*, a foot). The highest order of the Crustacea, which have ten ambulatory feet, the cephalic, thoracic, and pro-abdominal segments united, and the branchiæ concealed under the sides of the carapace, as seen in the *astacus fluviatilis*.

DECA'RBONIZA'TION. The process of depriving a body of its carbon; as employed, artificially, for converting cast iron into malleable iron; and, in nature, in removing the superfluous carbon of the seed in the function of germination.

DECI'DUOUS (*decido*, to fall off). Falling off; a term applied to any thing which falls off in a certain stage of growth, as the terminal whorls of the pupaform land-shells, the petals and sepals of certain flowers, &c. The term is synonymous with *caducous*, and opposed to *persistent*, which denotes permanence.

DE'CIMAL (*decimus*, the tenth). A *fraction* whose denominator is 10, or some power of 10, as 100, 1000, &c. Instead, however, of *writing* the denominator under the numerator, as in vulgar fractions, it is *expressed* by pointing off, from the right of the numerator, as many figures as there are cyphers in the denominator; thus, ·2, ·23, ·127, signify respectively $\frac{2}{10}$, $\frac{23}{100}$, $\frac{127}{1000}$.

DECLE'NSION (*declino*, to deflect). In Grammar, the deriving of the cases of nouns from one another; the changes of termination corresponding to the various relations in which the subject is conceived to stand.

DE'CLINATE (*declino*, to bend downwards). Bent downwards; as applied to the stamens of plants when they all bend to one side, as in amaryllis.

DECLINA'TION (*declino*, to bend). The distance from the equator of the parallel described by a star; it is counted from 0 up to 90 degrees, and is austral or southern, boreal or northern, in reference to the equator. Declination on the celestial globe corresponds with latitude on the terrestrial; and the *parallels of declination* are similar to the *parallels of latitude*.

1. *Declination circles* are small circles of the sphere, parallel to the equator, in which the stars perform their apparent diurnal revolution.

2. *Declination of the magnetic needle* is the angle which the horizontal needle makes with the geographical meridian of any given place.

DECO'LLATED (*decollo*, to behead). A term applied to those univalve shells in which the apex or head is worn off in the progress of growth.

DECOMPOSI'TION. The resolution of a body into its component parts, either spontaneously or by chemical agency.

DE'COMPOUND. A term applied, in Botany, to those ramifications of plants which are variously compounded, as to leaves in which the petiole bears secondary petioles. When the secondary petioles are divided into a third set, such leaves are said to be *supradecompound.*

DE'CREMENT (*decrementum,* a decrease). A term used in Crystallography to denote a *deficiency* of successive layers of molecules in a crystal, when this deficiency takes place in any regular order. This decrement is measured by the edges of the *defect* or part wanting to complete the simple or primary form; and the relation which these edges bear to the corresponding edges of the primary form, is called the *law of the decrement.* This is invariably found to be a simple numerical ratio, rarely exceeding the number six. The planes resulting from these decrements are called *secondary planes,* and the forms bounded by secondary planes are *secondary forms.*

Decrements in breadth are those in which each lamina has only the height of a molecule, so that their whole effect, by one, two, three, &c., courses, is in the way of breadth. *Decrements in height* are those in which each lamina, exceeding only the following one by a single course in the direction of the breadth, may have a height double, triple, quadruple, &c., of that of a molecule: this is expressed by saying, that the decrement takes place by two courses, three courses, &c. in height.

DECREPITA'TION (*decrepo,* to crackle, as a candle, when almost entirely burnt). The crackling noise which occurs when certain salts part with their water of crystallization, on the application of heat, and fall in pieces.

DECU'MBENT (*decumbo,* to lie down). Lying prostrate, but rising from the earth at the upper extremity, as applied to the directions taken by plants.

DECU'RRENT (*decurro,* to run down). *Decursive.* Running down; a term applied, in Botany, to leaves which are prolonged down the stem, giving it a winged appearance.

DECUSSA'TION (*decusso,* to cross like an X). A term applied to parts which cross each other, as leaves on a stem, when arranged in pairs which alternately cross each other.

DEDUCTIVE REASONING. The process of scientific inquiry by which we pursue laws into their remote consequences, as distinguished from *inductive reasoning,* by which we arrive at laws or axioms by an accumulation of facts.

DE'FERENT CIRCLE (*defero,* to carry away). In the Ptolemaic system, a circle or orbit on which the centre of another circle or orbit is carried round. Thus, the earth's orbit is a *deferent* on which the moon's orbit is carried. See *Epicycle.*

DE'FINITE TERM. In Logic, a term which defines, or marks out, a particular class of beings, or a single person, as distinguished from an *indefinite term,* which does not define or mark out an object. Thus, all animals are rational, or not-rational; the former is a definite, the latter an indefinite term. Definite terms are *positive,* indefinite terms are privative or *negative.*

DEFINI'TION. A metaphorical term, literally signifying the "laying down a boundary," and employed, in Logic, to denote "an expression which explains any term, so as to *separate* it from every thing else," as a boundary separates fields.

A *definition* is called *nominal,* when it merely explains the meaning of the term; *real,* when it explains the nature of the thing; *essential,* when it assigns the constituent parts of the essence or nature; *accidental,* when it assigns the properties and accidents of the essence; *physical,* when it lays down the real parts of the essence which are actually separable; *metaphysical* or logical, when it lays down the ideal parts of it, which cannot be separated except in the mind.

DEFLAGRATION (*deflagro,* to be utterly consumed by fire). The oxidation of metals by mixing them with nitrate or chlorate of potash, and projecting the mixture into a red-hot crucible.

1. *Deflagrating Mixtures.* These are generally made with nitre, the oxygen of which is the active ingredient in promoting their combustion.

2. *Deflagrator.* The name given by Dr. Hare to a very effective battery, in which the plates were so connected together as to admit of the whole being immersed into the exciting liquid, or removed from it, at the same instant.

DEFLE'CTION (*deflecto,* to bend off). The distance by which a curve departs from another curve or from a straight line; or any effect of curvature or of discontinuous change of direction; also, the bending of a ray of light from its rectilinear course towards an opaque body in its immediate neighbourhood. See *Diffraction.*

DEGLUBITRI'CES (*deglubo*, to pull off the skin or rind). Huskers; the name given by Macgillivray to an order of birds which remove the shell or husk of seeds in their bill, before swallowing them. They are all easily recognized by their stout conical bill, and include all our small finch-like birds. Most of them have a modulated song, which is, however, much inferior to that of the Cantatrices.

DEGRADING CAUSES. A term applied, in Geology, to those causes which refer to the dissolving and wearing away of the elevated parts of the earth's surface, and the carrying of these parts down into lower levels. These causes are *meteoric*, connected with the atmosphere; *fluviatile*, depending on rivers; and *oceanic*, in which the ocean is the immediate agent.

DEGREE, MINUTE, SECOND. The circumference of every circle, whatever be its actual dimensions, is usually considered as consisting of 360° (degrees), each of which is divided into 60′ (minutes), each of these again into 60″ (seconds), and so on to thirds (‴), and fourths (⁗), and fifths, if necessary, each term being a sixtieth of its predecessor. By some writers the decimal system is preferred.

DEGREE, IN ALGEBRA. The degree of an algebraical term is the number of letters which enter into it as factors; thus x^2y^3 is absolutely of the fifth degree, but of the second degree with regard to x, and of the third degree with regard to y. The *degree of an equation* is the power of its highest term; if the index of this term be 4, the equation is said to be of the fourth degree.

DEHI'SCENCE (*dehisco*, to gape). A term applied, in Botany, to the spontaneous separation of the valves of the fruits of certain plants, for the discharge of the seeds; and, in Zoology, to the splitting open of the bag which contains the eggs.

DEINOTHE'RIUM (δεινὸν θηρίον, a terrible beast). A fossil genus of gigantic pachydermata, characterized by the *downward* projection of enormous tusks from the lower jaw.

DE'LIAN PROBLEM. A celebrated problem, proposed by the oracle at Delos, and known to geometers as the *duplication of the cube.*

DELIQUE'SCENCE (*deliquesco*, to melt away). The property of certain salts of becoming liquid by their attracting moisture from the atmosphere. In Botany, a panicle is said to be *deliquescent*, when it is so much branched that the primary axis disappears—seeming, as it were, to *melt away.*

DELPHI'NIDÆ (*delphinus*, a dolphin). The Dolphin tribe; a family of the cetaceous Vertebrata, distinguished from the Balænidæ, or Whale tribe, by the relative size of the head and body: in the former, the head is not out of the usual proportion; in the latter, it is immoderately large.

DELPHI'NUS. The Dolphin; one of the old Greek constellations, consisting of eighteen stars, and succeeding Aquila in the heavens.

DE'LTA (δέλτα, the Greek letter Δ). A term applied to the alluvial land formed by a river at its mouth, when it divides, before entering the sea, into separate and diverging streams. The term was first applied in the case of the Nile, from the resemblance of the alluvial land to the form of the Greek letter Δ, the sea forming the base of the triangle; but geologists employ the term in analogous cases, without reference to the precise shape.

DE'LTOID (δελτοειδὴς, delta-shaped, triangular). Shaped like the Greek letter Δ; a term applied to a solid, the transverse section of which has a triangular outline.

DEMONSTRA'TION (*demonstro*, to point out). In the old writers, this term signified no more than the *pointing out* the connexion between a conclusion and its premises, or that of a phenomenon with its asserted cause. It now denotes a necessary consequence, and is synonymous with *proof.*

DEMO'TIC WRITING (δημοτικὸς, of the people). A mode of writing *in common use* among the Egyptians, approaching very nearly to the Chinese method. It is also termed the *epistolographic* and the *enchorial* style.

DE'NEB. An Arabic term for *tail*, generally applied to the bright star (β) in the tail of Leo.

DENO'MINATOR. An arithmetical term, employed in fractions, to denote the number of parts into which the unit, or integer, is divided. The other part of the fraction, or the *numerator*, denotes how many of these parts are taken to make up the given fraction.

DE'NSITY (*densitas*, closeness). A

term relating to the *compactness* of bodies, and denoting the comparative quantity of matter, in different bodies, which is contained under a certain bulk. As gravity is understood to act in proportion to the relative quantity of the matter of bodies, their specific gravities are presumed to be the measure of their densities. See *Rarity.*

DENTIRO'STRES (*dens*, a tooth, *rostrum*, a beak). A group of the *Insessores*, or Perching birds, in which the horny covering of the upper mandible is notched or toothed towards the point, as in the shrikes, the thrushes, the warblers, the chatterers, and the fly-catchers.

DENUDATION (*denudo*, to make bare). The carrying away, by the action of running water, of a portion of the solid materials of the land, by which inferior rocks are laid bare.

DEONTO'LOGY (δέον, what is due, λόγος, an account). The *science of duty;* a term applied by the followers of Bentham to their system of ethics.

DEOXIDA'TION. The separation of oxygen from a body; the reducing a body from the state of an oxide.

DEPA'RTURE. A nautical term, denoting the number of miles which a ship has sailed east or west; but more specifically defined to be "the sum of all the successive elementary meridian distances, when the nautical distance is assumed to be divided into an indefinite number of equal parts." See *Nautical Distance.*

DEPHLEGMA'TION. The chemical process of concentration, by depriving a body of water. By *phlegma* is meant a watery distilled liquor, as distinguished from a spirituous liquor.

DEPHLOGI'STICATED. That which is deprived of its *phlogiston*; in modern language, that which is oxidized. The term is derived from the old theory of combustion, in reference to which, oxygen gas was called dephlogisticated air; and chlorine, dephlogisticated marine acid. See *Phlogiston.*

DEPRESSION, ANGLE OF. The angle by which a line drawn from the eye to any object dips below the horizon.

DEPRESSION, IN ALGEBRA. The reduction of an equation to a lower degree, by dividing both sides of it by a common measure.

DEPRESSION OF THE HORIZON. *Dip of the horizon.* In Nautical Astronomy, the depression or dipping of the visible horizon below the true horizontal plane, owing to the eye of the observer being placed above the level of the surface of the sea.

DERBYSHIRE SPAR. Fluor-spar, technically called blue-john; fluate of lime, or a combination of calcareous earth with fluoric acid, found abundantly in Derbyshire.

DEREB ADIGE. A star of the first magnitude in the northern constellation Cygnus.

DERIVATION, LAW OF. In finding the successive differential co-efficients of a power of x, the law is, to get the next differential co-efficient, multiply the last by its exponent, and reduce the exponent by a unit.

DERI'VATIVE WORDS. In Grammar, these are words either compounded of two significant words in the language, or of one significant word and a termination which modifies its meaning, as *schoolmaster*, *scholar.* They are distinguished from *primitive words*, which have no derivation in the language, as *school.*

DERMA'PTERA (δέρμα, skin, πτερὸν, a wing). Ear-wigs; an order of insects, having their anterior pair of wings coriaceous, not employed in flight; the posterior membranous, only partially covered by the elytra.

DERME'STIDÆ (*dermestes*, from δέρμα, skin, ἐσθίω, to eat). Skin-eaters; a family of Coleopterous insects, of the section Necrophaga of Macleay, named from the genus *dermestes*, which is well known for its ravages on the preserved skins of animals.

DE'RMOBRANCHIA'TA (δέρμα, skin, βράγχια, gills). A family of Gasteropods, named from the genus *dermatobranchus*, and comprising those mollusks, which respire by means of external branchiæ or gills, having the form of membranous plates, filaments, or tufts.

DE'RMOSKE'LETON (δέρμα, skin, σκέλετον, skeleton). The hard integument which covers most invertebrate, and some vertebrate animals.

DERO'SNE'S SALT. A crystalline substance, obtained by treating opium with ether, and also termed narcotine and opiane.

DESCENDING NODE. That point of a planet's orbit, where it cuts the ecliptic, proceeding southward, marked ☋.

DESCRIPTION. In Logic, an *accidental definition*, or that which assigns the circumstances *belonging* to the essence, *viz.* properties and accidents. See *Definition.*

DESPUMA'TION (*despumo*, to scum).

Literally, the throwing off of froth or scum, and generally, the clarifying of a fluid, or the separating its foul parts.

DESQUAMA'TION (*desquamo*, to scale fishes, to bark trees). The falling off of the cuticle, in the form of *squamæ* or scales.

DETER'MINATE PROBLEM. A problem which admits of one solution only, or of a limited number of solutions; as distinguished from an *indeterminate* problem, which admits of an indefinite number of solutions.

DETONA'TION (*detono*, to thunder mightily). Instantaneous ignition, accompanied by a loud noise and a violently disruptive force, owing to the sudden expansion of gas.

DETRI'TUS (*de*, from, *tero*, to rub). Matter worn or rubbed off from rocks, consisting of blocks of various sizes, gravel, sand, and clay.

DEUTO- (δεύτερος, second). A prefix denoting two, or double, as *deut*-oxide, having two degrees of oxidation; *deuto*-chloride, &c.

DEUTOXIDE (δεύτερος, second). A term applied to a substance which is in the *second* degree of oxidation. This term is often used to denote a compound of 3 atoms of oxygen with 2 of metal, as in deutoxide of manganese, of lead, &c.

DEVE'LOPMENT. In Algebra, the process by which any mathematical expression is changed into another of equivalent value or meaning, and of more expanded form.

DEVONIAN SYSTEM. A geological system, comprising the *old red sandstone*, and forming the material of the grand and rugged mountains which fringe many parts of our Highland coasts, and range, on the south flank of the Grampians, from the eastern to the western sea of Scotland. These formations, in Devonshire and Cornwall, abound in shells and corals, and present a structure which brings them into a mineralogical comparison with our older slate rocks.

DEW. The moisture insensibly deposited from the atmosphere on the surface of the earth. It occurs whenever that surface is lower in temperature than that of the dew-point of the atmosphere immediately in contact with it.

DEW-POINT. That temperature of the atmosphere at which its moisture begins to be precipitated. By some, it is called the point of saturation; by Daniell, the degree of "the constituent temperature of atmospheric vapour."

DEXIA'RIÆ. A family of Dipterous insects of the section Creophilæ, named from the genus *dexia*, and subsisting chiefly on the juices of flowers.

DEXTRAL (*dexter*, the right hand). On the right hand, as applied to the mouth or aperture of the great majority of spiral shells; when the mouth is on the left, it is said to be *sinistral* or reversed. No generic distinctions can, however, be founded on this character.

DEXTRIN (*dexter*, the right hand). Mucilaginous starch, prepared by boiling a solution of starch with a few drops of sulphuric acid. Its name is derived from its property of turning the plane of the polarization of light to the right hand.

DIA (διά). A Greek preposition, denoting *through*. Words compounded with διὰ imply *extension*, *perversion*, *transition;* also that which in English and Latin is expressed by the prefixes *di-* or *dis-*, as in divido, to divide; disjungo, to disjoin.

DIACAU'STIC (διὰ, through, καυστικὸς, burning). A term applied to those caustic curves, which are formed by refraction, as distinguished from the *catacaustic* curve, which is formed by reflection. See *Caustic curve.*

DIACOU'STICS (διακούω, to hear through). That branch of physics which treats of the properties of sound refracted in passing through media of different densities.

DIACRI'TIC MARKS (διακριτικὸς, fit to distinguish). Marks employed, in Palæography, to distinguish letters which are similar in form; thus, in the German running hand, the letter *u* is distinguished by the superposition of the mark ˘ from the letter *n*.

DIADE'LPHIA (δὶς, twice, ἀδελφὸς, a brother). The seventeenth *class* of plants in the system of Linnæus, characterized by the union of the filaments into two parcels, or brotherhoods. See *Adelphia.*

DIÆ'RESIS (διαιρέω, to divide). A division; a grammatical figure, denoting the division of one syllable into two, as *silüæ* for *silvæ*.

DIAGO'METER, ELECTRICAL (διάγω, to conduct, μέτρον, a measure). An apparatus used by Rousseau for ascertaining the conducting power of oil, as a means of detecting its adulteration. It consists of one of Zamboni's dry piles, and a feebly-magnetized needle, moving freely on a pivot. The deviation of the needle is less in proportion to the low conducting power of the interposed substance.

DIA'GONAL (διὰ, through, γωνία, an angle). A right line drawn across a quadrilateral figure, from one angle to another; by some called the diameter of the figure.

DI'AGRAM (διάγραμμα, a figure or plan). A mathematical figure of any kind, drawn for the purpose of illustration.

DIAKE'NIUM. The term by which Richard designates the fruit of the Umbelliferæ, from its consisting of two akenia. See *Achænium*.

DIAL, or SUN-DIAL. An instrument for determining the hour of the day by the shadow of a point or line upon a graduated surface.

DI'ALECT (διάλεκτος, discourse). The language of a country, especially that of a particular district; any variety of a common language.

DIALE'CTICS (διαλεκτικὸς, skilled in argument). In Aristotle, this term denotes the *logic of probabilities*, as opposed to strict philosophical argument. Plato employed it as synonymous with *metaphysics*, or the highest philosophy. The term simply means "the art of conversation," but is now generally applied to the practical part of logic.

DIA'LLAGE' (διαλλαγὴ, difference). A variety of *augite*, generally of a bronze yellow colour, possessing the most perfect cleavage in the direction of the diagonal of the prism, its natural joints and fractures exhibiting a very *different* lustre and appearance.

Diallage Rock, or Euphotide. An ornamental stone, consisting of felspar and diallage, in crystals aggregated together in the manner of granite. The diallage in the rock is called *gabbro*.

DIALU'RIC ACID (διὰ, through, οὖρον, urine). A new acid produced, in combination with ammonia, by the decomposition of alloxantin.

DIA'METER (διαμετρέω, to measure through). A straight line passing through the centre of a circle, and terminating at both ends in the circumference.

Diameter, transverse and conjugate. These terms are applied to the two unequal diameters of an ellipse, the former to the longer, the latter to the shorter, diameter. They are also termed the *greater* and the *lesser axis*. These lines are at right angles to each other. Any other line which passes through the centre of an ellipse, and terminates in opposite points of its circumference, is also said to be a *diameter*.

DIAMOND. A brilliant gem, consisting of carbon in its highest state of purity. *Rose-diamonds* are usually cut out of the octohedral crystals; *brilliants*, from those with curvilinear faces.

DIA'NDRIA (δὶς, twice, ἀνὴρ, a man). The second *class* of plants in the system of Linnæus, characterized by the presence of two stamens.

DIAPA'SON (διὰ πασῶν, through all). In Music, the interval of the octave; the compass of an instrument or of the voice, a term signifying the same as *concert-pitch*.

DIA'PHANOUS (διὰ, through, φαίνω, to show). That quality of a substance which renders it permeable to light. Translucent is a more common term of the same import. *Transparent* expresses more than translucent, implying not merely the admission of light through the substance, but the vision of external objects. The terms *semi-translucent* and *semi-transparent* denote feebler degrees of these qualities.

DIAPHO'NICS (διὰ, through, φωνὴ, sound). The doctrine of refracted sound.

DI'ASPORE (διασπορὰ, dispersion). A rare mineral, which crackles by the heat of a candle, and is *dispersed* in minute fragments.

DI'ASTASE (διάστασις, separation). A vegetable principle, allied in its general properties to gluten, which appears in the germination of barley and of the seed of plants, and converts their starch into gum and sugar for the nutrition of the embryo. The name is derived from its property of *separating* two supposed constituents of starch.

DIATHE'RMANOUS (διαθερμαίνω, to warm through). A Greek term synonymous with the Latin *transcalent*, and denoting the free permeability of a substance by heat.

Diathermancy. The property possessed by nearly all diathermanous bodies, of admitting the passage only of certain species of calorific rays. When the *quantity* of heat transmitted independently of the *quality* is to be denoted, the term *diathermaneity* has been suggested by Melloni, in order to preserve the same termination as in the word *diaphaneity*, indicating the analogous property in relation to light.

DIATO'NIC SCALE (διὰ. through, τόνος, a tone). A scale of music, consisting of seven intervals, viz. five tones and two semitones.

DIBO'THRIANS (δὶς, twice, βόθριον, a pit). A division of tape-worms, including those *bothriocephallans* which have only two fossæ or pits on the head.

DIBRA'NCHIA'TA (δὶς, twice, βράγχια, gills). An order of *Cephalopods*, in which the branchiæ are two in number, one situated on each side of the body. It embraces all the ordinary genera, and is subdivided into two tribes, *viz*. the *decapods*, which have the eight ordinary arms and the two longer tentacula, and the *octopods*, in which the tentacula are absent. See *Tetrabranchiata*.

DI'CERATES (δὶς, twice, κέρας, a horn). A family of Gasteropods which have two tentacula on the head, in De Blainville's arrangement. The *diceras* was applied by Lamarck to a fossil genus of bivalves.

DICHO'TOMOUS (δίχα, doubly, τέμνω, to divide). A term applied to stems or branches which bifurcate, or are continually divided into pairs. Hence, to *dichotomize*, is to cut into two equal and similar parts.

DI'CHROISM (δὶς, twice, χρῶμα, colour). In Optics, the property by which a crystallized body assumes two distinct colours according to the direction in which light is transmitted through them.

DI'CHROITE. A mineral consisting of a silicate of alumina and magnesia.

DICLE'SIUM (δικλὶς, folding two ways). In Botany, a collective fruit, consisting of a pericarp indehiscent, one-seeded, enclosed within an indurated perianth, as in mirabilis.

DI'COTYLE'DONS (δὶς, twice, κοτυληδὼν, a seed-lobe). A grand division of the vegetable kingdom, comprising all those plants in which the embryo contains two cotyledons or seed-lobes. The dicotyledonous embryo coincides with the exogenous development of wood, and, hence, *Dicotyledons* and *Exogens* are convertible terms.

DICTUM DE OMNI ET NULLO. A principle established by Aristotle as the basis of his logical system, *viz*. "that whatever is predicated (*i. e.* affirmed or denied) universally of any class of things, may be predicated, in like manner (*viz.* affirmed or denied), of any thing comprehended in that class."

DICTYO'PTERA (δίκτυον, a net, πτερὸν, a wing). An order of insects, comprising the *cock-roaches*, in which the wings are four in number when they exist; but they are generally of equal size, and never folded.

DIDA'CTYLE (δὶς, twice, δάκτυλον, a finger or toe). Two-fingered, or two-toed; as applied to various animals which have two digits on their extremities.

DI'DYM (δίδυμος, twin). The name of a metal recently discovered united with oxide of cerium, and so called from its being, as it were, the *twin*-brother of lantanium, which was previously found in the same body.

DIDYNA'MIA (δὶς, twice, δύναμις, power). The fourteenth *class* of plants in the system of Linnæus, characterized by the presence of four stamens, of which two are long, two short. This condition occurs in the natural order Labiatæ.

DIELE'CTRIC. A body which has the power of transmitting the electric influences through itself, — a property observed in the most perfect non-conductors of electricity, whether solid, liquid, or aëriform. See *Induction*.

DIERESI'LIS (διαίρεσις, separation). A general term applied by Mirbel to those fruits which spontaneously separate into several cocci, when ripe, as in the mallow. The term is almost synonymous with *carcerule*.

DI'FFERENCE. DIFFERENTIA. In Logic, the formal or distinguishing part of the essence of a species; in common discourse, it is the *characteristic;* when necessarily applicable, it is a property; when contingently, an accident.

DIFFER'ENTIAL CALCULUS. The term *differential*, in the higher Mathematics, denotes a quantity infinitely small, or less than any assignable magnitude. The object of the *differential calculus* is to find the ratios of the differences of variable magnitudes, on the supposition that these differences become *infinitely small.* It agrees with *fluxions* in every respect excepting its notation and the manner of its explanation.

DIFFERENTIAL COEFFICIENT. In analysis, the ratio of the differential of any function of a variable quantity to the differential of the variable.

DIFFRA'CTION OF LIGHT (*diffringo*, to break in pieces). *Inflexion of light.* The turning of light from a rectilinear course by the interposition of an opaque body.

DIFFU'SION OF HEAT. A term expressive of the modes by which the equilibrium of heat is effected, *viz.* by conduction, by radiation, and by convection.

DIFFUSION VOLUME. A term adopted to express the different disposition of gases to interchange particles; the diffusion-volume of air being 1, that of hydrogen gas is 3·83.

Diffusion Tube. An instrument for determining the rate of diffusion for different gases. It is simply a graduated tube, closed at one end by plaster of Paris, a substance, when moderately dry, possessed of the requisite porosity. The *diffusion of gases,* as thus conducted, closely corresponds with the *endosmosis of liquids,* which occurs under similar circumstances.

DIGA'MMA. *Double gamma.* In some parts of Greece, the old Greek γ was a kind of aspirate, called, from the way of writing it (Ϝ), *digamma.* This aspirate was carried by the Pelasgian race into Italy, and remained in Latin as a real consonant V, *vau.* It supplies the data for resolving those cases of metrical difficulty, where the lengthening of a short syllable uniformly takes place before particular words.

DIGE'STER. A strong vessel of copper or iron, with an air-tight lid, for preventing the loss of heat by evaporation.

DIGE'STION (*digero,* from *diversim gero,* to carry into different parts). In Physiology, the change of the food into *chyme,* and the absorption and distribution of the more nutritious parts, or the *chyle,* through the system. In Chemistry, the continued action of a solvent upon any substance.

DIGESTIVE SALT. A salt discovered by Sylvius, since named muriate of potash, and now chloride of potassium.

DI'GIT (*digitus,* a finger). An old measure of a finger's breadth. In Astronomy, it denotes the twelfth part of the diameter of the sun or moon, and is used to express the quantity of an eclipse: thus the moon is said to be six digits eclipsed, when half of her face is covered by the earth's shadow. In Arithmetic, a digit is any symbol of number from 0 to 9.

DI'GITATE (*digitus,* a finger). A term applied to that kind of expansion, in which the parts are spread out into finger-shaped processes, as in the outer lip of the scorpion *strombi.*

DIGITI'GRADA (*digitus,* a toe, *gradior,* to walk). A division of the terrestrial *Carnivorous* animals, which walk upon their toes, and bound along with considerable elasticity and swiftness, as the weasel, the civet, the hyena, and the cat tribes. See *Plantigrada.*

DIGY'NIA (δὶς, twice, γυνὴ, a woman). The name of those *orders* of plants in the system of Linnæus, which are characterized by the presence of two pistils.

DILE'MMA (δίλημμα, a double proposition; from δὶς, twice, and λαμβάνω, to take). In Logic, a complex kind of conditional syllogism, having more than one antecedent in the major premiss, and a disjunctive minor. In other words, it is a complex conditional reasoning, in which either one of the *antecedents* must be admitted, or one of the *consequents* must be denied.

The expression, *horns of a dilemma,* relates to the taking hold of both ways: if a person is not caught by the one antecedent or consequent, he must be caught by the other.

DILU'VIUM (*diluo,* to wash away). Accumulations of gravel and loose materials, which are said to have been produced by the action of a diluvian wave or deluge sweeping over the surface of the earth.

DIME'NSION. In Algebra, a term synonymous with *degree;* thus x^2y is of three dimensions, or of the third degree. In Geometry, length is of one dimension, surface of two, solidity of three; hence, geometry of three dimensions is another term for solid geometry.

DI'MERA (δὶς, twice, μέρος, a part). A section of *Homopterous* insects, in which the tarsi are two-jointed, as in the Aphidæ.

DIMO'RPHOUS (δὶς, twice, μορφὴ, form). A term applied to some natural and to some artificial productions, which occur in two distinct forms. For example: arragonite and carbonate of lime are chemically the same, though belonging to different primary forms; and the crystals of sulphate of nickel, if deposited from an acid solution, are square prisms; but if from a neutral solution, they are right rhombic prisms. This property of assuming two incompatible forms, is called *dimorphism.*

DIMYA'RIA (δὶς, twice, μῦς, a muscle). A general name for those bivalves whose shells are closed by two adductor muscles distinct and widely removed from each other, as in the mussel. See *Monomyaria.*

DIŒ'CIA (δὶς, twice, οἶκος, a house). The twenty-second class of plants in Linnæus's system, in which the stamens and pistils are in separate flowers, and on separate plants.

DIOPHA'NTINE PROBLEMS. A species of problems, in which it is required to solve certain questions, the answers to which shall be whole numbers only. They are found in a treatise on Algebra by Diophantus, an Alexandrian Greek, who lived in the second or third century of the present era. In character they closely resemble the Hindoo Algebra.

DIO'PSIDE (δίοψις, a view through). A mineral which may be considered as the type of the *augite* genus. Several varieties, differing little from the above, are called baikalite and fassaite, names indicative of their locality.

DIO'PTASE. Emerald copper ore; a crystallized silicate of copper, found in Siberia and the Bannat.

DIO'PTRICS (δίοπτρα, an optical instrument). That branch of the science of Optics, which treats of the *refraction of light*, when it passes through different media, as air, water, glass, &c. The phenomena are generally referred to the subject of *refraction.*

DIO'SMEÆ. The Buchu tribe of Dicotyledonous plants. Trees and shrubs with *leaves* exstipulate, dotted; *flowers* axillary or terminal, polypetalous, hermaphrodite; *stamens* hypogynous; *ovarium* many-celled; *fruit* consisting of several concrete capsules; *seeds* twin or solitary.

DIO'XIDE. According to the electrochemical theory, the elements of a compound may, in relation to each other, be considered oppositely electric; the equivalents of the *negative* element may then be distinguished by Latin numerals, those of the *positive* by Greek; thus a *bin*-oxide denotes a compound which contains two equivalents of the *negative* element oxygen; whereas a *di*-oxide indicates that one equivalent of oxygen is combined with two of some *positive* body. And so of *bi*-chloride, *di*-chloride, &c.

DIP. When a geological stratum does not lie horizontally, but is inclined, it is said to *dip* towards some point of the compass, and the angle it makes with the horizon is called the angle of dip or inclination.

DIP OF MAGNETIC NEEDLE. The angle which the magnetic needle, when poised so as to move freely in a vertical direction, makes with the plane of the horizon. It is more scientifically termed the inclination of the needle, or the magnetic inclination.

DIP OF SEA HORIZON. The apparent angular depression of the visible horizon, caused by the position of the observer above the surface of the sea.

DI'PHYDA (δις, twice, φύω, to grow). A group of the *Acalephæ*, named from the genus *diphyes*, in which each animal seems to consist of two portions so slightly joined together, that it is difficult to understand their connexion.

DI'PLOE' (διπλόη, a joining). A term applied by Link to the parenchymatous substance of the leaf, which lies immediately beneath the two surfaces. See *Mesophyllum.*

DI'PLO-GANGLIA'TA (διπλοῦς, double, γαγγλίον, a nerve-knot). A designation of the *Entomoida*, or articulate animals, which have "their nervous columns arranged in the same relative position as the diplo-neura, with the ganglia increased in size, and corresponding with the increased development of the segments and of their lateral appendages."—*Grant.*

DI'PLO-NEURA (διπλοῦς, double, νεῦρον, a nerve). A designation of the *Helminthoida*, comprising the various forms of Worms, in which the nervous columns have their ganglionic enlargements very slightly developed, and are marked by a greater lateral separation from each other along the median line, than is observed in the next sub-kingdom."—*Grant.*

DIPLO'PTERA (διπλοῦς, double, πτερὸν, a wing). A group of aculeate hymenopterous insects, which have their upper wings folded longitudinally, when at rest, as in some species of wasp.

DIPLOTE'GIA (διπλοῦς, double, τέγος, a covering). In Botany, a compound fruit, differing from the *capsule* only in being adherent to the calyx. It occurs in campanula.

DIPNEUMO'NEÆ (δὶς, twice, πνεύμων, a lung). A section of spiders which have only two pulmonary sacs.

DIPPEL'S OIL. An animal oil procured by the destructive distillation of animal matter, especially of albuminous and gelatinous substances.

DI'PTERA (δὶς, twice, πτερὸν, a wing). An order of insects which have only one pair of wings fully developed, and these are on the *mesothorax.* Instead of posterior wings, there are pedunculated appendages, called *halteres* or *poisers.* The mouth contains a soft proboscis, of which the common house-fly affords a familiar instance. See *Rhipiptera.*

DIPTEROCA'RPEÆ. The Camphor-tree tribe of Dicotyledonous plants. Trees abounding in resinous juice; *leaves* alternate; *flowers* polypetalous; *stamens* hypogynous; *carpella* concrete; *calyx* tubular; *fruit* coriaceous.

DI'PTEROUS (δὶς, twice, πτερὸν, a wing). Two-winged; a term applied to certain seeds which have their margins prolonged in the form of wings.

DIPTERY'GIANS (δὶς, twice, πτερύγιον, a fin). A family of fishes comprising those which have only two fins.

DIPY'RE (δὶς, twice, πῦρ, fire). *Leucolite.* A silicate of alumina and lime, found in the western Pyrenees. This mineral derives its name from its twofold susceptibility to the action of fire: when heated before the blowpipe, it first becomes phosphorescent, and then fuses.

DIRECT AND RETROGRADE. Astronomical terms expressive of the direction in which the heavenly bodies move. The *direct* course is from west to east; the *retrograde*, from east to west. These motions are otherwise indicated, the former by the term *in consequentia*, the latter by *in antecedentia.*

DIRECTION, NUMBER OF. The number of days after the 22nd of March, including both days, upon which Easter Sunday takes place.

DIRECTIVE FORCE. A term employed in Magnetism to denote the tendency in one magnet to assume a particular position with relation to another magnet.

DIRE'CTRIX. *Linea directrix.* A term applied, in Conic Sections, to a line drawn at right angles to the axis of a parabola, when produced to a certain point; and this point is equally distant from the vertex as the focus of the curve.

DISC (δίσκος, *discus*, a dish, or quoit). The face of a circular plate; a term applied to the *apparently* plane surface of the heavenly bodies, from the resemblance of this surface to a flat round dish. The *discus* of the ancients was a circular piece of wood, stone, or metal, used in their games.

DISCHARGER. An instrument for discharging a jar or battery of its electricity. It consists of two bent metallic rods, each of them terminating at one end in a brass knob, and connected at the other end by a joint, which is fixed to a glass handle.

DISCO'BOLI (δίσκος, a disk, βάλλω, to throw). A family of *Malacopterygious* or soft-spined fishes, in which the ventral fins are formed into a disk or sucker, by which the fish is enabled to attach itself to rocks and other hard substances.

DI'SCOID (δισκοειδὴς, quoit-shaped). Circular or disk-shaped, and much flattened, as the fresh-water genus *planorbis*, and many land-shells.

DISCORD. *Dissonance.* In Music, a dissonant and inharmonious combination of sounds, unless treated according to the rules of art.

DISCOURSE. *Discursus.* In Logic, an operation of the mind commonly called *reasoning*, or the act of proceeding from one judgment, to another *founded* upon that one, or the result of it.

DISCOVERY OF TRUTH. There are two modes of discovering truth. 1. The one is by *Information*, and it relates to matters of fact previously unknown, but communicated by observation and testimony, independent of all *à priori* reasoning. 2. The other is by *Instruction*, and it relates to truths which may be elicited by reasoning, and are therefore implied in what we already know, independent of observation or testimony. The historian *informs*, the mathematician and the moralist *instruct.*

DISCRE'TE PROPORTION (*discretus*, separated). An arithmetical proportion, in which the ratio of the antecedents to the consequents is different from the ratio of the consequent of the first pair of terms to the antecedent of the second, as in 2 : 3 : : 4 : 6. On the other hand, a *continual* proportion is that in which the ratio of every contiguous pair of terms is the same throughout, as in 2 : 4 : : 8 : 16.

DISCRE'TE QUANTITY (*discretus*, separated). A quantity of which the component parts have a separate and distinct existence: *numbers*, for instance, are discrete quantities, being composed of separate units.

DISJU'NCTIVE. A logical term applied to a *proposition* which consists of two or more categoricals, so stated as to imply that *some one* of them must be true; *e. g.*, either A is B, or C is D. A *syllogism* is said to be *disjunctive*, the reasoning of which turns on such a proposition.

DISK. A term applied, in Botany, to certain bodies or projections, situated between the base of the stamens and the base of the ovary, forming part with neither. It is often incorrectly called *nectary.*

DISPERSION OF LIGHT. The di

vision of a ray of white light into its variously coloured component rays, as seen upon the spectrum, after it has undergone refraction by transmission through a prism.

DISSE'PIMENT (*dissepio*, to separate). *Septum.* A term applied, in Botany, to the partition which divides a capsule into cells.

DISTANCES, LAW OF. A curious law observed by Professor Bode, of Berlin—that *the intervals between the planetary orbits go on doubling as we recede from the sun, or nearly so.* This law was interrupted between Mars and Jupiter, but the deficiency was afterwards strangely supplied by the discovery of *four* new planets in that very interval, revolving in orbits tolerably well corresponding with the law in question.

DISTHENE. *Cyanite.* A very hard crystallized mineral, consisting of subsilicate of alumina.

DI'STICHOUS (δὶς, twice, στίχος, a row). Arranged in two rows, as the florets of many grasses; a term synonymous with *bifarious.*

DISTILLA'TION (*distillo*, to drop by little and little). The vaporization and subsequent condensation of liquids, by means of a retort, alembic, or still. Dry distillation is performed in the same way as the humid, except that the substance is neither immersed nor dissolved in any menstruum. It is termed *sublimation.*

Distillation, Destructive. The process of exposing organized substances, or their products, to distillation, until the whole has undergone the entire effects of the furnace.

DI'STOMA (δὶς, twice, στόμα, the mouth). Intestinal worms with two pores.

DISTRA'CTILE (*distraho*, to draw apart). In Botany, a connective which separates into two unequal portions, the one supporting an anther, the other without an anther, as in salvia.

DISTRI'BUTED. An epithet applied, in Logic, to a term which is employed in its full extent, so as to comprehend all its significates—every thing to which it is applicable.

DISTRIBU'TION OF HEAT. A term expressive of the several ways by which the rays of heat, as they fall upon the surface of a solid or liquid body, may be disposed of. 1. They may be *reflected*, or rebound from the surface; 2. they may be *absorbed*, or received into the substance of the body; or, 3. they may be *transmitted*, or pass directly through its substance. In the first and third cases, the temperature of the body on which the rays fall is entirely unaffected; in the second, it is increased.

DI'THYRA (δὶς, twice, θύρα, a door). A term applied by Aristotle to the bivalved mollusca, or those which have double shells, as the oyster and the cockle. These comprise the first order of Cuvier's *Acephala*, the seventh order of his *Gasteropoda*, and the fifth class of his *Mollusca.* See *Monothyra.*

DIU'RNA (*diurnus*, daily). A designation of the Butterfly tribe of Lepidopterous insects, from their habit of appearing only by day. They are distinguished by the vertical position of their wings during repose. The tribe corresponds with the Linnæan genus *Papilio.*

DIU'RNAL MOTION (*diurnus*, daily). The *daily* revolution of the earth upon its axis, which produces day and night, and causes us to imagine that the sun, planets, and stars, move round the earth. See *Axis.*

DIURNA'TION (*diurnus*, daily). A term introduced by Dr. M. Hall, to express the state of some animals, as the bat, during the day, as contrasted with their activity at night. See *Hybernation.*

DIVA'RICATING (*divarico*, to spread one from another). Spreading out nearly at a right angle from any thing, as branches from a stem.

DIVERGENT RAYS. Those rays, which, proceeding from a point of the visible object, are dispersed, and continually depart one from another, in proportion as they are removed from the object; in which sense they are opposed to *convergent* rays.

DIVERTI'CULUM. The Latin term for a by-road, and hence applied to a blind tube branching out from the course of a longer one.

DIVISIBI'LITY (*divido*, to divide). The property by which bodies are capable of being separated into minute parts. The divisibility of matter, though mathematically illimitable, is closely connected with its constitution, and must, therefore, cease with the ultimate particles of which all matter is supposed to consist.

DIVI'SION. In Arithmetic, the method of finding how often one number is contained in another, *i.e.* how often one number must be taken to make up another. Hence Division bears the same relation to *Subtraction*, as Multiplication bears to *Addition*. In Algebra, the sign $\div$ placed between two quantities means that the former of those quantities is to be divided by the latter: thus $a \div b$ means that a is to be divided by b. This division is more simply expressed by making the former quantity the *numerator*, and the latter the *denominator*, of a fraction, as $\frac{a}{b}$, which expresses the quotient of a and b.

DIVISION, FALLACY OF. A fallacy in Logic, occasioned by using the middle term in the major premiss *collectively*, and in the minor *distributively*, the term which is first taken collectively being afterwards divided.

DIVISION, LOGICAL. A metaphorical expression to signify "the distinct (*i.e.* separate) enumeration of several things signified by one common name." It is analogous to the real division of a whole into its parts, and is directly opposite to *generalization*, which is performed by means of abstraction.

DOBEREINER'S LAMP. A method of producing an instantaneous light, by throwing a jet of hydrogen gas upon recently-prepared spongy platinum; the metal instantly becomes red hot, and then sets fire to the gas. The discovery was made by Dobereiner of Jena, in 1824.

DODE'CAGON (δώδεκα, twelve, γωνία, an angle). A regular polygon of twelve equal sides. The area of such a figure is, in general, equal to the square of its side multiplied by the constant number 11·196.

DODECAGY'NIA (δώδεκα, twelve, γυνή, a woman). The designation of those *orders* of plants in the Linnæan system, which are characterized by the presence of twelve styles.

DODECAHE'DRON (δώδεκα, twelve, ἕδρα, a seat). A geometrical solid, contained by twelve equal pentagons, which are equilateral and equiangular.

DODECA'NDRIA (δώδεκα, twelve, ἀνήρ, a man). The eleventh *class* of plants in the system of Linnæus, characterized by the presence of twelve stamens.

DOG-DAYS. The period of the year comprising forty days, twenty before and twenty after the heliacal rising of the *dog-star*. This period, being the hottest of the year, was considered by the Greeks as the season of fevers, plagues, and death. See *Canicular Period.*

DOKIMA'STIC ART (δοκιμάζω, to prove by trial). The art of assaying minerals and ores, in order to determine the quantity of metal which they contain.

DOLA'BRIFORM (*dolabra*, an axe, *forma*, likeness). Axe-shaped; a term applied to the succulent leaves of a species of Mesembryanthemum, which are thick at one border and thin at the other.

DO'LERITE. One of the varieties of the Trap rocks, composed of augite and felspar.

DO'LOMITE. A crystalline limestone, containing magnesia, and named after the French geologist Dolomieu. The compact or brown kind is commonly called Magnesian Limestone.

DOMI'NICAL LETTER. One of the first seven letters of the alphabet, employed in the calendar to denote the Sundays, or days of the Lord (i.e. *Domini*), throughout the year. If the year consisted of exactly 52 weeks, the dominical letter would always be the same; but, as there is an excess of $1\frac{1}{4}$ day, the Sunday letter falls back *one letter* each year, except in leap-year, when it falls back *two letters.* As every fourth year is bissextile, and as the number of letters employed is seven, the same order of dominical letters will return only in four times seven, or twenty-eight years, whereas, without that intervention, it would return in seven.

DO'MITE. A white mineral found in the Puy de Dome in Auvergne.

DO'RSAL (*dorsum*, the back). Any thing placed on the back. In Malacology, the term is applicable to the valves of bivalves, in which it serves to distinguish that part of their circumference on which the bosses are placed, from that which is nearest the belly, when the animal is crawling. The upper part of a spiral shell, when the mouth is downward, may be termed its back, or dorsal surface. The term *dorsad* signifies towards the back.

DORSIBRA'NCHIA'TA (*dorsum*, the back, *branchia*, gills). An order of *Anellida*, or red-blooded worms, in which the branchial tufts are attached to the back. These were termed by Milne Edwards *errantes*, from their powers of locomotion. In popular language they are termed sea-centipedes, sea-mice, or nereids.

DOUBLE STARS. A term applied to some fixed stars which, though apparently single to the naked eye, are found, by means of the telescope, to consist of two or more stars exceedingly near to each other.

DOUBLER. An instrument employed in electrical experiments, and so contrived that, by executing certain movements, very small quantities of electricity communicated to a part of the apparatus may be continually *doubled*, until it becomes perceptible by an electroscope.

DRACO. The Dragon; a northern constellation, consisting of eighty stars, the principal of which is Rastaber.

DRAUGHT OF WATER. The depth to which the lowest point of a ship sinks in water; in ships of the largest size the draught is nearly thirty feet.

DRIFT. A term used in Navigation to express the angle which the line of a ship's motion makes with the nearest meridian, when she *drives* with her side to the wind, and is not governed by the power of the helm; and also the distance which the ship drives on that line in a storm.

The *drift of a current* is its velocity; the direction of a current is called its *set*.

DROP. The smallest perceptible portion of a liquid. It is of a globular form, and thus illustrates the theory that the molecular forces of all bodies are equally exerted around the centre of their masses.

DROSO'METER (δρόσος, dew, μέτρον, a measure). An instrument for measuring the quantity of dew deposited upon the surface of a body.

DRUPE (*drupæ*, unripe olives). In Botany, a pulpy fruit, without a valve or outward opening, containing a bony nut, as the cherry.

DRY PILE. The name of a galvanic apparatus, constructed with pairs of metallic plates, separated by layers of farinaceous paste mixed with common salt. The name is inappropriate, as the apparatus evidently owed its efficacy to the moisture of the paste.

DRY ROT. A species of decay to which wood is subject. The wood loses all its cohesion, and becomes friable, and fungi generally appear upon it; but the first destructive change is probably of a chemical kind, allied to the action of fermentation.

DU'ALISM (*duo*, two). A system of philosophy which refers all existence to *two* ultimate principles.

DU'BHE. A star of the first magnitude in the northern constellation Ursa Major.

DUCT, IN PLANTS. A membranous tube with conical or rounded extremities, and its sides marked with transverse lines, rings, or bars; unlike the spiral vessel, it is incapable of unrolling without breaking. The varieties are the closed, the annular, the reticulated, and the scalariform.

DUCTI'LITY (*duco*, to draw). That property of bodies by which they admit of being drawn out into wire. Platinum has been drawn into threads not much larger than those of the spider's web, and gold wire has been found so thin, that 550 feet of it weighed only one grain.

DU'CTUS (*duco*, to lead). A duct or tube which conveys away the secretion of a gland.

DU'MASINE. An empyreumatic oil, obtained by rectifying acetone derived from the acetates.

DUMOSE (*dumus*, a bush or bramble). The character of a shrub which is low and much branched.

DUNES or DOWNS. Low hills of blown sand which skirt the shores of Holland, England, Spain, and other countries.

DUODE'CIMALS (*duodecim*, twelve). An operation in Arithmetic, technically called *cross multiplication* and *squaring of dimensions*. Its object is to find the contents of any surface or solid by multiplying together its linear dimensions.

DUPLICATE RATIO. The composition of a ratio with itself *once;* thus, the ratio of a^2 to b^2 is the duplicate of the ratio of a to b. If there be three quantities in continued proportion, the first is to the third in the duplicate ratio of the first to the second; thus, if a, b, c be continual proportionals, that is, if $a : b :: b : c$, then, a is to c in the duplicate ratio of a to b.

DUPLICATION OF THE CUBE. A celebrated problem, proposed by the oracle of Delos, *viz.* "to double the altar of the God;" this was tantamount to finding the side of another cube of twice the solid content. This problem, requiring the solution of a cubic equation, was incapable of solution by pure geometry, and was, therefore, reduced by Hippocrates of Chios to the insertion of two mean proportionals between two given straight lines.

DU'PLO- (*duplum*, from *duo*, two, *plica*, a fold). A Latin prefix, signifying *two-fold*, as in duplo-carburet; also, that the organs of any body to which the term is prefixed are twice as numerous or large as those of some other body.

DURA'MEN (*durus*, hard). The interior, more deeply-coloured, and harder portion of the trunk and branches of trees, commonly called *heartwood*, as distinguished from the exterior portion, alburnum, or sapwood.

DUTCH GOLD. An alloy of copper and zinc, in which the zinc is in greater proportion than it exists in brass. It is allied to *tombac* and *pinchbeck*.

DUTCH MINERAL. Metallic copper beaten out into very thin leaves.

DUTCH PINK. Chalk or whiting, dyed yellow, with a decoction of birch leaves, French berries, and alum.

DYES. Colouring matters derived from vegetable substances. See *Lakes*.

DYKE or DIKE (a provincial name for *wall*). A term applied to a mass of the unstratified or igneous rocks, as granite, trap, and lava, when it appears as if injected into a rent in the stratified rocks, cutting across the strata. A mass of this kind is sometimes seen running along the ground, and projecting, like a *wall*, owing to the softer strata on both sides of it having wasted away. A *dyke* differs from a *vein* in being generally of larger dimensions, and having its sides parallel for a considerable distance; while a vein has generally many ramifications, and these often become gradually reduced to slender threads.

Dyke is also the name given to a mound of earth, stones, &c., employed as a barrier against inundation by the sea, as the dykes of Holland.

DYNA'MICS (δύναμις, force). That branch of mechanics which relates to the action of forces which are not *in equilibrio*. It, therefore, treats of bodies in motion. See *Statics*.

DYNAMIC THEORY. A theory for explaining the nature of matter, or the mode of its formation, invented by Kant. He supposed that all matter existed or was originated by two antagonist and mutually counteracting principles, which he called attraction and repulsion, all the predicates of which he referred to motion. See *Atomic Theory*.

DYNAMO'METER (δύναμις, force, μέτρον, a measure). A measurer of power; an instrument for measuring, with accuracy, the magnifying powers of microscopes and telescopes, the force of machinery, the strength of animals, &c.

DYNA'STIDÆ (δυνάστης, a master). A family of beetles, comprehending the giants of the Coleopterous order, remarkably powerful in excavation.

DYSO'DILE (δυσώδης, fetid). A mineral found near Syracuse, emitting, on combustion, an insupportably fetid odour.

E

EAGLE STONE. *Aetites lapis.* A globular clay iron stone, supposed to have been found in the nest of the eagle.

EARTH. *Terra.* A planet of the solar system, the orbit of which lies between Venus and Mars. It revolves round the sun in 365 days, 5 hours, and 48 minutes, at the distance of 95 millions of miles. Its diameter is 7912 miles. Its rotation upon its axis furnishes a uniform measure of time, called the *sidereal day*.

EARTH (in Chemistry). A solid, opaque, friable substance, without lustre, and incombustible; it is thus distinguished from metals on the one hand, and from carbon and other combustible substances on the other. In chemical language, the earths are termed *metallic oxides*, and formerly, *earths of the metals*. Four of these, *viz.* baryta, strontia, lime, and magnesia, are termed, from their properties, *alkaline earths*.

EARTH OF ALUM. A preparation used for paints, and procured by precipitating the earth from alum dissolved in water, by adding ammonia or potass.

EARTH OF BONE. A phosphate of lime, sometimes called *bone phosphate*, existing in bones after calcination.

EARTH-FALL. A natural phenomenon which occurs when portions of the earth's surface are elevated, then cleft asunder and depressed, the space once occupied by solid earth becoming covered with water.

EARTHQUAKE. A sudden motion of the solid surface of the globe, probably occasioned by the same causes as those which produce volcanic eruptions.

EAST. That point of the compass which is in a direction at right angles to that of the north and south, and towards the right hand of the spectator when facing the north. It is that point of the horizon in which the sun is seen to rise at the time of the equinoxes.

EASTER. This holiday is directed to be celebrated on the first Sunday after the full moon which happens next after the 21st of March; this, being the fourteenth day of the first Jewish month, corresponds with the first day of the week after the Passover, the anniversary of the Resurrection of Christ. The time at which this day must happen varies with the year; but the limits within which it must fall are the 22nd of March and the 25th of April, inclusive, making a period of thirty-five days.

EBULLI'TION (*ebullitio*, a bubbling up). The boiling or bubbling of liquids; the production of vapour at the *boiling point.*

EBURNI'NÆ. A sub-family of the *Turbinellidæ*, or Turnip-shells, named from the typical genus *eburna*, and having the base of the shell truncate and notched, the pillar smooth, and the inner lip considerably thickened and spreading.

ECCE'NTRIC (ἐκ, out, κέντρον, the centre). A term applied to circles and spheres which have not the same centre, and consequently are not parallel; in opposition to *concentric*, which denotes a common centre, and therefore parallelism.

Eccentricity. The distance of the centre of the orbit of a planet from the centre of the sun; that is, the distance between the centre of the ellipsis and the focus.

E'CDYSIS (ἔκδυσις, the act of stripping). Moulting of the skin.

ECHI'NATE (ἐχῖνος, the sea-hedgehog). Bristly; covered with stiff hairs or prickles, like an echinus; a term applied to bristly fruits, as that of the sweet chestnut, &c.

ECHI'NIDÆ (ἐχῖνος, the sea-hedgehog). A family of radiated animals, comprehending those marine animals commonly known by the name of *sea-eggs* or *sea-urchins*, and constituting, according to De Blainville, the second order of the class *Echinodermata*. By the term *echini*, geologists denote the calcareous petrifactions of the echinus, which occur through all the formations, from the epoch of the transition series to the present time.

ECHI'NODE'RMATA (ἐχῖνος, the sea-hedgehog, δέρμα, skin). A class of the Radiata, comprising aquatic invertebrate animals, which have the surface of their skin generally covered with calcareous spines, as the common sea-urchin and the star-fish. The following orders have been founded on differences of their general form:—

1. *Crinoïda*, or those species, chiefly fossil, which are fixed by a jointed peduncle, and have long ramified articulated tentacula extending from around the abdominal cavity, as in *encrinus* and *pentacrinus.*

2. *Asterida* or *Stellerida*, comprising the articulated, free, flexible, stellated species, which are destitute of peduncle, and with a short axis, as in *asteria.*

3. *Echinida*, in which the body is inflexible and covered with a solid articulated shell, the exterior surface being covered with moveable calcareous spines, as in *echinus.*

4. *Holothurida*, in which the axis of the body is placed horizontally, and there is a soft, coriaceous skin, seldom protected with spines, as in *holothuria.*—*Grant.*

E'CHO (ἠχὼ, a sound; especially, *a returned sound*). A wave of sound, which, falling perpendicularly on a reflecting surface, returns in the same direction, and arrives at the spot from which it originated.

ECLIPSE (ἔκλειψις, a defect). A *lunar eclipse* is caused by the *projection of a shadow* upon the (full) moon, in consequence of the interception of the sun's rays by the earth. A *solar eclipse* is occasioned by the interception of a part or of the whole of the sun's rays, by the (new) moon. The eclipse is *partial*, when the moon hides only a part of the sun's disk; *total*, when she covers the whole of it; *annular*, when the sun, masked by the moon, projects all round in the form of a luminous ring; *central*, when the spectator's place is in the prolongation of the line joining the centres of the sun and the moon.

ECLI'PTIC (ἔκλειψις, an eclipse). The orbit described apparently by the sun round the earth, and in reality by the earth round the sun. It is named from the circumstance that all *eclipses* can happen only when the moon is in the same plane, or very near it. The lowest and highest points of the ecliptic are the winter and summer solstices respectively. See *Solstice.*

1. *Ecliptic, Obliquity of.* The inclination of the ecliptic to the equator of the earth, amounting to an angle of 23° 28′. This inclination gives rise to the phenomena of the seasons.

2. *Ecliptic, Plane of.* A plane supposed to pass through the ecliptic, and to be indefinitely extended. In other words, it is the plane which contains the earth's orbit.

3. *Ecliptic Digit.* The twelfth part of the diameter of the sun or moon; a term employed for defining the magnitude of an eclipse. Thus, an eclipse is said to be of ten digits, if ten parts of the twelve constituting the diameter are concealed.

4. *Ecliptic Limits.* The greatest distances at which the moon can be from her nodes, in order that an eclipse of the sun or moon may take place.

E'DDY (Sax. *ed*, water, *ea*, backwards). A circular motion of the water, occurring in *rivers* when the proper current meets a counter current; and in *seas*, where two currents run in parallel, but different, directions, as between the equatorial and the North African current. See *Whirlpool.*

EDENTA'TA (*edentulus*, toothless). An order of the Mammalia, agreeing in the unimportant character of the absence of incisive teeth. The order may be distinguished into the *edentata proper*, containing the ant-eaters, armadillos, &c., all of which are insectivorous; and the *tardigrada*, or sloths, characterized by the slowness of their motion.

The term *Edentata* has also been applied to a group of Crustaceous animals, in which the mouth is prolonged in the shape of a sucker. See *Maxillosa.*

E'DINGTONITE. A crystalline mineral, found implanted upon crystallized Thomsonite, in the Kilpatrick hills, near Glasgow, accompanied by calcareous spar and harmotone.

EDRI'OPHTHA'LMA (ἑδραῖος, sessile, ὄφθαλμος, the eye). A group of the malacostracous *Crustacea*, which have immoveable sessile eyes. It comprises the orders Amphipoda, Læmodipoda, and Isopoda. See *Podophthalma.*

EDULCORA'TION (*dulcis*, sweet). The process of freeing a difficultly soluble substance from one that is easily soluble by means of distilled water. It differs little from *lixiviation*, except that the former term respects the insoluble residue, the latter the soluble portion.

EDULCORA'TOR. *Dropping Bottle.* An instrument for supplying small quantities of water to test tubes, watch-glasses, &c., by causing water to drop from a phial, properly prepared, by expansion of the liquid by the warmth of the hand.

EFFERVE'SCENCE (*effervesco*, to grow hot). The commotion produced in liquids by the rapid escape of gas, in the form of bubbles, as on pouring acid on chalk.

EFFLORE'SCENCE (*effloresco*, to blow as a flower). The pulverescence of crystals, by the removal of their moisture, on exposure to the air. See *Deliquescence.*

E'GERAN. A sub-species of pyramidal garnet, occurring in a bed of felspar and hornblende, at Haslan, near Eger in Bohemia.

EIGHTH (in Music). The octave or eighth note of the diatonic scale. It is a perfect concord, and harmonizes with the fifth and the third. It may form a part of any chord.

EI'SENRAHM. A term applied to a red and a brown ore—the scaly iron ore, and the scaly magnetic ore.

ELA'IN (ἔλαιον, oil). The oily principle of solid fats, so named by its discoverer, Chevreul: this and *stearine* constitute the fixed oils. *Elaic* or *oleic* acid is obtained from elain by saponification with a strong solution of potash.

ELA'OLITE (ἔλαιον, oil, λίθος, a stone). A sub-species of pyramidal felspar, of a blue and of a red colour. The former is opalescent, and is termed *fettstein* by Werner, from its resinous nature.

ELAIOMETER (ἔλαιον, oil, μέτρον, a measure). An instrument for detecting the adulteration of olive oil.

ELAO'PTEN (ἔλαιον, oil). The liquid portion of a volatile oil. The concrete portion is called *stearopten.*

ELA'STIC CURVE. The figure assumed by an elastic plate, of which one end is fixed horizontally, while the other end is loaded with a weight which, by its gravity, produces the curve.

ELASTI'CITY (ἐλαύνω, to push or drive back). The property or power by which a solid or fluid body, when compressed or forcibly expanded, endeavours to reassume its former bulk.

E'LATER (ἐλατήρ, a driver). A spiral fibre, enclosed in a membranous case, found in great numbers mixed with the sporules, in the thecæ of some cryptogamic plants. When fully ripe, the membranous case usually disappears, the spiral fibres, which are powerfully hygrometric, uncurl, and the sporules are dispersed.

ELATE'RIDÆ. A family of Coleopterous insects, belonging to the section Sternoxi, and named from the genus *Elater*, a species of which (*noctilucus*) is known in America by the name of firefly.

ELATE′RIUM (ἐλατήριος, driving away). A term applied by Richard to the tricoccous capsule of Euphorbia, in which the cells burst from the axis with elasticity into two valves. See *Regma.*

ELEA′TIC PHILOSOPHY. A system of philosophy introduced by Xenophanes of Elea, or Velia of the Romans. Its object was to deny the validity of the testimony of sense and experience, and to ascribe to reason exclusively the merit of arriving at the truth, independently of any attempt to reconcile appearance and reality.

ELECTRICITY (ἤλεκτρον, amber). The science which investigates the attractions and repulsions, the emission of light and explosions, which are produced, not only by the friction of vitreous, resinous, and metallic surfaces, but by the heating, cooling, evaporation, and mutual contact of a vast number of bodies.

1. *Electricity, vitreous and resinous.* 1. Vitreous electricity comprises the phenomena exhibited on rubbing surfaces of *glass.* This is also called *plus* or *positive* electricity, and it denotes that the substance is overcharged. 2. Resinous electricity relates to the phenomena displayed on rubbing *amber* or *resinous* substances. This is also called *minus* or *negative* electricity, and it denotes that the substance is undercharged.

2. *Electrics and non-electrics.* The former are bodies capable of electric excitement; the latter are bodies totally incapable of it. These terms were formerly supposed to be respectively synonymous with *non-conductors* and *conductors;* but the distinction is quite inaccurate, since a conductor may be also an electric, if excited in an *insulated* state.

3. *Electric circuit.* The communication of electricity from one body to another is effected by means of metallic wires. It is said to move in a current, from an overcharged to an undercharged body; this current is termed the *electric circuit.* If the communication be arrested by bad conductors, the circuit is said to be *broken;* it is at this point of the circuit that bodies are placed, through which the electrical current is to be passed.

4. *Electrical machine.* An apparatus for developing a large quantity of electricity of high tension. It consists of 1, a *non-conductor*, usually of glass, which is positively excited by friction; 2, a *rubber*, or soft, elastic substance, of low conducting power, which is negatively excited; and 3, two *conductors,* which are hollow, insulated, metallic cylinders, the one for receiving the positive electricity of the glass, the other, the negative electricity of the rubber; the former is called the *positive,* the latter the *negative* conductor.

5. *Electric current.* The discharge of electricity by convection, or the transfer of the two electrical forces in opposite directions, defined by Faraday as "an axis of power having contrary forces, exactly equal in amount, in contrary directions."

6. *Electrical column.* A species of electrical pile, invented by De Luc, composed of thin plates of different metals in the usual order, with discs of writing paper interposed between them.

ELECTRICITY, ANIMAL. *Galvanism.* A power possessed by, and evolved from, certain living animals, by means of which several of the phenomena, exhibited by common and by voltaic electricity, are produced. Volta proved, that the phenomena proceeded from the contact of two dissimilar metals, copper and iron, producing such a disturbance of the electric equilibrium, as was sufficient to affect the most delicate of all electroscopes, the irritability of a newly-killed frog, though it was insensible to every electroscope of human construction.

ELECTRO-CHEMISTRY. A system of chemistry based on the assumption that the attractive force of opposite electricities is the fundamental cause of all chemical combination; every compound substance, therefore, consists of one positively and one negatively electrified element.

ELE′CTRODE. A term in Electricity, synonymous with *pole,* denoting the *way* (ὁδὸς) by which the electric current enters or departs. It is, therefore, the boundary of the decomposing matter in the direction of the electric current, the *anode* being the point at which the electricity *enters,* or the point immediately touching the *positive* pole; the *kathode,* the point at which the electricity *departs,* or the point next to the *negative* pole.

ELECTRO-DYNAMICS. The science which investigates the phenomena of electricity in motion; and this comprises the phenomena of electro-magnetism and magneto-electricity.

ELECTRO′LYSIS (λύω, to decompose). The process of resolving a compound body into its elements, or proximate principles, by the voltaic current.

Substances directly decomposable by electricity are termed *electrolytes*. The elements of an electrolyzed body are called *ions*—that which passes to the anode, *anion*; that to the kathode, *kation*. Thus, if water be electrolyzed, oxygen and hydrogen are *ions*; the former an *anion*, the latter a *kation*.

ELECTRO-MAGNETISM. The science which comprehends all the phenomena in which electricity develops magnetic influences.

ELECTRO-METALLURGY. The art of working in metals by galvanic agency.

ELECTRO'METER (*μέτρον*, a measure). An instrument for ascertaining the intensity of electricity, or the quantity and quality of electricity in an electrified body.

ELECTROMO'TIVE FORCE. A term applied by Volta to the development of electricity in voltaic combinations. The bodies by whose mutual contact it is developed are called *electromotors*.

ELECTRO-NEGATIVES and POSITIVES. These terms denote that, during decomposition, bodies exhibit a different electric condition from that of the pole at which they appear. The former are those bodies which appear at the *positive* pole of the battery; the latter are those which pass to the *negative* pole. Oxygen is the most electro-negative, potassium the most electro-positive, of all known bodies.

ELECTRO'PHORUS (*φέρω*, to carry). A carrier of electricity: an instrument which possesses the property of maintaining for a length of time, by its inductive process, the electrical tension which has been excited by friction in a non-conductor.

ELE'CTROPO'LAR. A term applied to conductors, one end or surface of which is positive, the other negative—a condition which they commonly exhibit when under the influence of induction.

ELE'CTROSCOPE (*σκοπέω*, to examine). An instrument for indicating electrical excitement, and the electrical state by which it is produced; in other words, for exhibiting the attractive and repulsive agencies of electricity.

ELECTRO - THERMANCY. The branch of science which investigates the effects produced by the electric current upon the temperature of good conductors, when it passes from one metal into another in the same circuit. These effects are the converse of those of *thermo-electricity*.

ELECTRO-TINT. An application of electrotype, in which the required subject is painted on copper with a thick varnish or paint; the plate is then prepared in the usual way, and submitted to the voltaic circuit; a plate is thus obtained from which prints are furnished.

ELECTROTO'NIC STATE. The peculiar latent state of an induced conductor, during the continued action of the electric current upon it, resembling that of a conductor put in a state of tension by induction.

ELECTROTYPE. The science by which *fac-simile* medals are executed in copper by means of electricity. It consists in preparing for a negative plate models or moulds of objects to be copied; and in so arranging the battery, or apparatus which generates the voltaic current, as to release the metals in a compact and solid form.

ELECTRO - VITAL CURRENTS. *Neuro-vital Currents*. The name of two electric currents, supposed to exist in animals,—the one external and cutaneous, moving from the extremities to the cerebro-spinal axis; the other internal, going from the cerebro-spinal axis to the internal organs situated beneath the skin.

ELE'CTRUM. Argentiferous gold; an ore of gold, consisting of 64 parts gold, and 36 silver, occurring together with massive heavy spar in Siberia.

ELEMENT. A simple substance; a substance which has not been chemically resolved into different substances, as iron. The rust of iron, on the other hand, is a *compound*, being resolvable into metallic iron, oxygen, and carbonic acid. A compound may consist of substances which are susceptible of further decomposition: these are called *proximate* elements. If the decomposition be repeated without obtaining simple substances, the constituents then found are *intermediate* elements; and those last arrived at are known as *ultimate* elements.

Example:—Saltpetre is a *compound*. It consists of two compounds, potash and nitric acid: these are *proximate* and *intermediate elements*. Each of these is resolvable—the former into potassium and oxygen, the latter into nitrogen and oxygen: these are *ultimate elements*.

E'LEMI. A resin which exudes from incisions made in the bark of the *Amyris elemifera*, an American tree.

ELE'NCHUS (ἔλεγχος, a proof). In

Logic, a syllogism by which the adversary is forced to contradict himself. The *ignoratio elenchi*, commonly called the fallacy of *irrelevant conclusion*, is a sophism which consists in proving something irrelevant, and therefore, though it may be perfectly true, it does not determine the question. The latent fallacy is best exposed by showing that both propositions may be equally true.

ELEVATING CAUSES. A term applied in Geology to those causes which refer to the operation of volcanoes, earthquakes, and gradually elevating forces. As *degrading causes* are chiefly owing to water, so *elevating causes* are chiefly owing to fire, and are, therefore, sometimes comprehended under the term *igneous agency*.

ELEVA'TION (*elevo*, to lift up). In Astronomy, the altitude or angular height of a celestial body above the horizon. The *elevation of the pole* is the arc of the meridian intercepted between the pole and the horizon.

ELIMINA'TION (*elimino*, to put out). The algebraical operation of reducing a number of equations, containing certain letters, to a smaller number, in which one or more of the letters shall not occur. To *eliminate* a quantity is, therefore, to cause that quantity to disappear from an equation.

ELIQUA'TION (*eliquo*, to clarify). The separation of a more fusible from a less fusible substance, by applying a degree of heat sufficient to fuse the former, but not the latter.

ELI'SION (*elisio*, a cutting off). In Grammar, the cutting off a vowel at the end of a word, for the sake of euphony or of metre.

ELIXIR (*elikscir*, Arab., an essence, or pure mass without any dregs). A term formerly applied to compound tinctures, and, by the alchemists, to various solutions in the art of transmutation.

ELLAGIC ACID (from the word *galle*, read backward). An acid which is obtained from galls, in the process for making gallic acid.

ELLIPSE (*ἔλλειψις*, a defect). A section of a right cone by a plane oblique to its base, but which does not meet it. It is named from its plane forming with the base of the cone a *less* angle than that of the parabola. To describe it, fix a circular thread by two points, and, keeping it at full stretch with the point of a pencil, carry the pencil all round: the two fixed points are the *foci* of the ellipse, and its *eccentricity* is its distance from the centre to the foci.

Ellipse, axes of. By generalizing these directions, we learn that an ellipse is a plane figure bounded by one curved line, of such a nature that the respective sums of the distances of any two points in it from the two foci, are equal. The line which joins the foci, and terminates both ways in the circumference, is the *major axis;* the line drawn through the centre at right angles to the major axis, and terminating both ways in the circumference, is the *minor axis* of the ellipse.

ELLI'PSOID (*ἔλλειψις*, an ellipse, *εἶδος*, likeness). A term generally applied to a spheroid. The *ellipsoid of revolution* is the solid generated by the revolution of an ellipse about its lesser axis.

ELLI'PSOSTO'MATA. A family of Gasteropods, in the arrangement of De Blainville, including all the *pectinibranchiate* gasteropods of Cuvier, except the genus pleurocerus.

ELLI'PTIC COMPASSES. An instrument for describing an ellipse by continued motion.

ELLIPTI'CITY. A term employed in describing the figure of the earth, to denote the deviation of the earth's form from that of a sphere. It means the fraction which the excess of the major axis over the minor axis of an ellipse is of the minor axis itself.

ELONGA'TION. An astronomical term for the angular distance between two celestial bodies, as seen from the earth. The term is commonly applied to bodies of the solar system, one of which is generally the sun. Hence, we speak of the *distance* of two fixed stars, but of the *elongation* of Mercury from the sun.

ELUTRIATION (*elutrio*, to cleanse). The chemical process of washing, by which the lighter earthy parts are separated from the heavier and metallic.

ELVAN COURSES. A local designation of the large beds or dykes of granite which frequently occur in the slaty rocks.

ELY'TRA (*ἔλυτρον*, a sheath). The wing sheaths, or upper crustaceous membranes, which form the superior wings of Coleopterous insects. They cover the body, and protect the true membranous wings.

EMA'RGINATE (*e*, out of, *margo*, the margin). Having a notch, as if a portion had been cut out of the margin, as the base of most predaceous testacea, not provided with a canal; the leaf of box, &c. The term is opposed to *immarginate*.

EMBERIZINÆ (*emberiza*, the bunting). Emberizine birds, or Buntings; a family of the *Deglubitrices* of Macgillivray, which gradually pass into the passeres, or sparrows. They have a strong, rapid, rather undulated flight, and move on the ground by short leaps.

EMBOITEMENT (the situation of one box within another, from *boite*, a box). A term used by Bonnet to describe that species of generation by which hundreds and thousands of individuals lie one within the other, each possessing a complete series of organized parts. See *Evolution*.

EMBOLI'SMIC (ἐμβολισμὸς, intercalation). A term synonymous with *intercalary*, generally applied to the additional months required to fill up the lunar cycle.

E'MBRYO (ἔμβρυον, from ἐν, in, βρύω, to bud forth). *Corculum*. In Botany, a fleshy body occupying the interior of the seed, and constituting the rudiment of the future plant. It is distinguished into three parts, the radicle, the cotyledons, and the plumule.

1. *Embryo-buds*. A term applied by Dutrochet to those *nodules* which occur in the bark of the beech, and some other trees, and which are externally indicated by small tumours of the bark. He considers them to be adventitious buds arrested in their development.

2. *Embryo*, *Fixed*. This term has been applied by some botanists to the *leaf-bud*. The function of the two organs is analogous, but their origin and structure are entirely different. The leaf-bud consists of both vascular and cellular tissue, the embryo of cellular tissue only; the leaf-bud is produced without fertilization, which is essential to the embryo; lastly, the leaf-bud perpetuates the individual, the embryo continues the species.

EMBRYO'TEGA (ἔμβρυον, embryo, τέγος, a covering). A small callosity observed in some seeds, at a short distance from the hilum; it gives way, like a lid or covering, at the time of germination, for the emission of the radicle of the embryo.

E'MERALD. A gem found in Peru, of a green colour, rather harder than quartz, and always in crystals, which are translucent and generally transparent. *Prismatic* emerald is the euclase of Haüy; *rhomboidal* emerald comprises the precious emerald and beryl. What is called *Oriental emerald* is a *green* sapphire. The *emerald of Brazil* is a *tourmaline*.

EME'RSION. An astronomical term, denoting the re-appearance of a heavenly body from behind another, after an eclipse or occultation.

E'MERY. A granular variety of corundum, found in Spain, the Greek islands, &c., and named from Cape *Emeri*, in the island of Naxos. When triturated and attached to brown paper, it forms *emery paper*, and is used for polishing.

EMISSION, THEORY OF. *Corpuscular theory*. A theory propounded by Newton for explaining the nature of light. According to this, the sun, as well as all luminous bodies, has the property of *emitting* exceedingly minute particles of its substance in right lines with prodigious velocity. See *Undulatory Theory*.

EMPI'RICAL (ἐμπειρικὸς, experienced). A term applied to an act which is purely *experimental*, or performed without previous experience or principle of guidance. It is remarkable that the term *empiricism*, which, strictly speaking, is the character of modern science, should have fallen into disgrace, and serve only to designate the practice of ignorant pretenders in the medical art.

EMPYREU'MA (ἐμπυρεύω, to set on fire). The peculiar vapour produced by destructive distillation. *Empyreumatic oils* are obtained by distilling organic substances at high temperatures. Hartshorn is called the empyreumatic alkali.

E'MYDÆ (*emys*, a tortoise). Freshwater Turtles, or Mud-Tortoises; a family of Chelonian reptiles, intermediate in form between the turtles and the land-tortoises. They are distinguished from the marine turtles by the distinctness of their clawed toes, which are, however, webbed, to enable them to swim, and to prevent their sinking in the mud.

E'MYDO-SAURIANS (ἐμὺς, the water-tortoise, σαύρα, a lizard). An order of the class *Reptilia*, including the tribe of Crocodiles, which form part of the order *Sauria* of Cuvier.

ENA'MEL. A peculiar preparation of glass, used in painting on enamel, in the imitation of precious stones, &c. Common glass, fused with oxide of tin, is converted into enamel.

ENA'LIOSAU'RIA (ἐνάλιος, marine, σαύρα, a lizard). An order of Reptiles, intermediate between the Turtles and

Crocodiles, and comprising the fossil genera *Ichthyosaurus* and *Plesiosaurus*, marine animals connected with the Chelonia by the flattening of their extremities into fin-like paddles.

ENCAU'STIC PAINTING (ἐγκαυστικὸς, belonging to burning in). A method of painting employed by the ancients, in which the colours were rendered permanent by a process of heating or burning. The practice is briefly, but not sufficiently, described by Pliny, in his "Natural History," xxx. 11.

ENCE'PHALA (ἐν, in, κεφαλὴ, the head). Those molluscous animals which have a distinct head.

ENCEPHALA'TA (ἐγκέφαλον, the brain). A term applied by Dr. Grant to the *Vertebrata*, consisting of animals in which the brain is enclosed in a bony cavity.

ENCHELIDE MONAD. An animalcule which performs the usual function of the green parts of plants, decomposing carbonic acid and evolving oxygen, under the influence of the light of the sun.

ENCHO'RIAL WRITING (ἐγχώριος, belonging to a country). The common mode of writing among the Egyptians, resembling the Chinese method, and also called *demotic* and *epistolographic*. It was termed *enchorial*, because its characters differed from those employed in Greece.

ENCKE'S COMET. A periodic comet of the solar system, revolving round the sun in about 1200 days, within the orbit of Jupiter.

E'NCRINITES (ἐν, in, κρίνον, a lily). *Stone-lilies*. Petrified radiated animals, included by Cuvier among his pedicillated echinoderms. The term is frequently applied to the *crinoidea* generally, both recent and fossil.

ENDE'CAGON (ἕνδεκα, eleven, γωνία, an angle). A plane geometrical figure bounded by eleven sides. If the sides are all equal, and the length of each be supposed = 1, the area of the figure is 9·36564.

ENDO- (ἔνδον). A Greek adverb, signifying *in, within*.

1. *Endo-carp* (καρπὸς, fruit). The innermost of the three layers which collectively form the pericarp of fruits; when it is of a bony consistence, it is also termed *putamen*. The stone of the drupe is the putamen or endocarp; by Richard, however, it is termed the *nux* or nut.

2. *Endo-gen* (γείνομαι, to be produced). Inside-grower; a plant which increases in diameter by deposition to the centre; a term descriptive of the structure of the axis of monocotyledonous plants, in which the newest-formed fibres are always developed towards the centre of the stem.

3. *Endo-phlœum* (φλοιὸς, bark). The liber, or the innermost layer of the bark of exogenous plants, composed partly of cellular, partly of woody tissue.

4. *Endo-phyllous* (φύλλον, a leaf). A term applied by Dumortier to the endorrhizous embryo, in consequence of the young leaves of monocotyledons being evolved from a coleophyllum, or leaf-sheath.

5. *Endo-pleura* (πλευρὰ, the side). The innermost layer of the testa, or integument of the seed of plants, named by Willdenow *tunica interna*, and by Mirbel, *tegmen* and *hilofère*.

6. *Endo-ptile* (πτίλον, a feather). A term applied by Lestiboudois to the monocotyledonous embryo, in consequence of its plumule being enclosed within the cotyledon.

7. *Endo-rrhizous* (ῥίζα, a root). A term expressive of the mode of germination in endogenous plants, in which the radicles are emitted from within the substance of the radicular extremity of the embryo, and are, in fact, enclosed within a sheath of this substance, called the *coleoptile*, coleophyllum, or leaf-sheath.

8. *End-osmose* (ὠσμὸς, impulsion). The property by which a rarer fluid passes through membranous substances into a cavity or space containing a denser fluid. The *endosmometer* is an instrument contrived by Dutrochet for measuring the force of this action.

9. *Endo-siphonites* (σίφων, a tube). A genus of extinct Cephalopods, with chambered convolute discoidal shells, having the siphon placed at the inner side of the convolutions, as in spirula. They occur in the slate rocks of the Cambrian system.

10. *Endo-sperm* (σπέρμα, seed). That which is within the seed: a term applied by Richard to the albumen, or body enclosing the embryo. By Jussieu, it was called *perisperm*.

11. *Endo-stome* (στόμα, a mouth). The foramen or orifice of the inner integument, or secundine, of the ovule, in plants.

12. *Endo-thecium* (θήκη, a case). A term applied by Purkinje to the fibro-cellular lining of the anther, in plants.

ENHARMO'NIC SCALE. A scale

in Music, which proceeds by quarter tones. Thus a distinction is made between C sharp and D flat, the former being $\frac{15}{16}$ths, the latter $\frac{9}{10}$ths of the string sounding C. The transition from the one to the other of these intervals is called an *enharmonic change*, and a change of key so effected is termed an *enharmonic modulation*. In the modern scale these intervals are practically disregarded.

E′NNEAGON (ἐννέα, nine, γωνία, an angle). A plane geometrical figure bounded by nine sides. Assuming the sides to be equal, and representing a side by 1, the area of an enneagon is 6·18182.

ENNEA′NDRIA (ἔννεα, nine, ἀνὴρ, man). The ninth *class* of plants in the system of Linnæus, characterized by the presence of nine stamens.

ENS. The present participle of the verb *sum*, employed as a substantive in philosophical language for any *being* or existence. In Chemistry, it denotes a substance supposed to contain all the qualities or virtues of the ingredients from which it is drawn, in a small compass: thus we have *ens Martis*, ammoniated iron; *ens Veneris*, muriate of ammonia and copper; *ens primum*, an alchemical tincture for the transmutation of the metals.

E′NSIFORM (*ensis*, a sword, *forma*, likeness). *Gladiate*. Sword-shaped; lorate; straight, flat, and pointed, as the leaf of iris.

ENTHELMI′NTHA (ἐντὸς, within, ἕλμινς, a worm). Intestinal worms; a term synonymous with *entozoa*.

E′NTHYMEME (ἐνθύμημα, a thought). An argument, called by Aristotle the *rhetorical syllogism*, i. e. a syllogism drawn from probable premises, and which, therefore, does not pretend *to be demonstrative*. In Logic, however, the term denotes an abridged form of argument or syllogism, in which one premiss is expressed, and the other understood, whether major or minor, as "Cæsar was a tyrant; therefore he deserved death."

ENTIRE. A term applied, in Botany, to *leaves* which have no marginal division, or toothings of any kind, as the leaves of galium. Sometimes it denotes *not pinnatifid*; and also, nearly destitute of marginal division.

E′NTOMOLINE (ἔντομον, an insect). A peculiar chemical principle, found in large quantities in the wings and elytra of coleopterous insects, and termed *chitine* by M. Odier.

ENTOMO′LOGY (ἔντομον, an insect, λόγος, an account). That branch of Zoology which treats of insects. The Greek word ἔντομα, as well as the Latin term *insecta*, relates to the division of the body of these animals into numerous segments.

ENTOMO′PHAGOUS (ἔντομα, insects, φάγω, to devour). Insect-eating; a term applied, in Zoology, to those animals which subsist on insects.

ENTOMOSTO′MATA (ἔντομον, an insect, στόμα, a mouth). The name given by De Blainville to a family of conchiferous mollusca, in which the mouth is armed with a proboscis. They constitute the second family of his first order *Siphonobranchiata*, and are nearly identical with the genus *buccinum* of Linnæus.

ENTOMO′STRACA (ἔντομα, insects, ὄστρακον, a shell). Shell insects; a section of the Crustacea, many of which are enclosed in an integument, like a bivalve shell. They are distinguished into the *Entomostraca* proper, and the *Xiphosura*. The orders are Copepoda and Ostrapoda.

ENTOZO′A (ἐντὸς, within, ζῶον, an animal). Intestinal worms; a class of articulated animals, comprising the parasites which inhabit the internal parts of other animals.

EN′TROCHI (ἐν, in, τροχὸς, a wheel). A genus of fossils, consisting of several round joints, which, when detached from one another, are called *trochitæ*. They seem to be the petrified arms of that singular species of the sea star-fish, called Stella arborescens.

E′OCENE (ἠὼς, the dawn, καινὸς, recent). A designation of the lowest division of the tertiary strata, containing an extremely small per centage of living species among its fossil shells, which indicates the first commencement, or *dawn*, of the existing state of the animate creation.

E′PACT (ἔπακτος, adscititious). A term applied, in Astronomy, to the number of days by which the solar year exceeds the lunar. The year of 365¼ days, contains twelve lunations and nearly eleven days more; so that, were it to begin with the new moon, she would be eleven days old on the first day of the succeeding year; the next year she would be twenty-two days; and on the third new year's day she would have passed a whole lunation, and about three days more. The age of the moon (thus varying) on the first day of any year is termed the *Epact.*

EPI- (ἐπί). A Greek preposition, with the radical signification of *upon;* but denoting also, in some compounds, *over, all through, besides.*

1. *Ep-agominæ* (ἐπαγόμεναι ἡμέραι, intercalated days). A term applied to the five days which were added by the Egyptians to their calendar at the end of each year, to complete the number of 365. At the end of every fourth year, a sixth *epagomene* was added, to remedy the inconvenience arising from the six hours still remaining at the completion of every year.

2. *Epi-genesis* (γένεσις, generation). A term applied to a theory of non-sexual generation, in which each new germ is an entirely new production of the parent organism. See *Evolution.*

3. *Ep-hemeridæ* (ἡμέρα, a day). A group of Neuropterous insects, named from the ephemera, or day-fly, which are aquatic in their preparatory states, and emerge from the water to undergo their final metamorphosis. The *ephemera* is so named from its last stage of existence being generally limited to twenty-four hours.

4. *Ep-hemeris* (ἡμέρα, a day). A term applied to an astronomical table or almanac which assigns the place of a planet for a number of successive days.

5. *Epi-blastus* (βλαστὸς, germen, a shoot). A term applied by Richard to a peculiar appendage which occasionally occurs in the monocotyledonous embryo, in the form of an anterior cotyledon.

6. *Epi-caridians* (καρὶς, a shrimp). A family of Isopodous crustaceans, which are parasitic upon shrimps.

7. *Epi-carp* (καρπὸς, fruit). The exterior portion of the pericarp, commonly termed the *skin* of the fruit.

8. *Epi-cycle* (κύκλος, a circle). Literally, a *circle upon a circle.* The ancient astronomers supposed that the motions of the heavenly bodies must necessarily be in circles: and in order to make that doctrine tally with observation, they invented, in succession, the two theories of *Epicycles* and *Eccentrics.* In the former, called also the *Concentric Theory,* the earth was supposed to be placed in the centre of a circle, on the circumference of which the centre of another circle revolved; and on the circumference of this second circle (called an *Epicycle*) the planet was imagined to move: a supposition which accounted in some degree for the apparent irregularities of its motion. The primary circle was called the *Deferent.* In the *Eccentric Theory,* the earth was also placed stationary in the centre of the starry sphere; but the sun was carried round in a circle, the centre of which was eccentric from that of the earth.

9. *Epi-cycloid* (κυκλοειδὴς, circular). If a circle roll upon the circumference of another circle instead of a straight line, points, either on, within, or without its circumference, if on the same plane, will form varieties of *Epicycloids.*

10. *Epi-dermis* (δέρμα, skin). The external covering of the skin, commonly called *cuticle,* in plants and animals. Also the outer rough coating of shells, over which it is spread as a fibrous horny skin, though destitute of sensation.

11. *Epi-dote* (δίδωμι, to give). A subspecies of prismatoidal augite, also termed acanticone and pistacite, occurring in primitive beds and veins. The name is said to be derived from an enlargement of the base of the prism in one direction, the prefix here denoting *besides.*

12. *Epi-gene crystals* (γένος, a kind). Substances found naturally crystallized in a form which does not belong to themselves, but to some other compound of the same base: thus, crystals of oxide of iron are found with the form of sulphuret or carbonate of iron. In these, it appears that the crystals must have undergone a chemical change, unaccompanied by change of form.

13. *Epi-geous* (γῆ, the earth). A term applied to the situation of plants, when they grow close upon the earth; and to those cotyledons which emerge from the ground, and assume the colour of leaves.

14. *Epi-gonium* (γονὴ, the seed). A membranous bag which encloses the conceptacle or capsule of Jungermannia, and is ruptured as the latter elongates. It is somewhat analogous to the calyptra of Mosses, but is not carried up on the summit of the capsule.

15. *Epi-gynous* (γυνὴ, a woman). That condition of the stamens of a plant, in which they adhere both to the calyx and the ovarium, appearing to be inserted upon the summit of the ovarium, as in umbelliferous plants.

16. *Epi-meral* (μέρος, a part or limb). A term applied to the part of the segment of an articulate animal which is above the joint of the limb.

17. *Epi-phlœum* (φλοιὸς, bark). A term applied by Link to the second portion of the bark of plants, consisting of several layers of thin-sided tubular cells, rarely coloured green. This is the *phlœum* or *peridermis* of Mohl.

18. *Epi-phragma* (φράγμα, a fence). A term applied, in Bryology, to the membrane (peristomium) which sometimes closes up the orifice of the theca. It is sometimes called *tympanum*, from the drum-like appearance which the theca thus presents.

19. *Epi-phyllospermous* (φύλλον, a leaf, σπέρμα, seed). An old term for those plants which bear their organs of reproduction upon the back of their fronds, as the ferns. These are now called *dorsiferous*, from *dorsum*, the back, and *fero*, to bear.

20. *Epi-phyllous* (φύλλον, a leaf). A term applied to any thing which is inserted upon the leaf of a plant.

21. *Epi-phyte* (φυτὸν, a plant). A plant which grows upon other plants, adhering to their bark, and rooting among the scanty soil found on their surface. The term is generally restricted to those *Orchidaceous* plants which grow upon trees. The old term was *epidendrum*.

22. *Epi-pterous* (πτερὸν, a wing). A term applied to a fruit or seed which is furnished with a broad margin or wing, when it terminates. See *Pterous*.

23. *Epi-rrheology* (ἐπιῤῥοὴ, a flowing on, λόγος, description). That branch of science which treats of the effects of external agents upon living plants.

24. *Epi-sperm* (σπέρμα, seed). The terms episperm and perisperm are applied by Richard to the testa, or integument of a seed—the spermoderm of De Candolle.

25. *Epi-zoa* (ζῶον, an animal). An order of the Entozoa, which are at first free and natant larvæ, afterwards fixing themselves permanently, by strong organs of attachment, to the soft superficial parts of aquatic animals.

EPI'STOLOGRA'PHIC WRITING (ἐπιστολὴ, a letter, γράφω, to write). A designation of the *demotic* or *enchorial* mode of writing, in common use among the Egyptians, and approaching very nearly to the Chinese method.

E'POCH (ἐποχὴ, a pause in the reckoning of time). In Chronology, a point at which one period closes and another begins. The *epoch of a star* is its place in the heavens. In order to predict the longitude of a planet at any epoch, some preceding epoch must be taken, at which the longitude is known. The latter is emphatically called *the epoch;* and the term *longitude at the epoch* has been shortened into *epoch*.

EQUATION (in Astronomy). The term applied by astronomers to their practice of *reducing* all their observations, both of right ascension and of declination, to some common and convenient epoch. These corrections, or *equations*, are necessary in consequence of the elliptic figure of the moon's orbit, the sun's attraction, and other causes.

1. By *equating the observation for nutation*, is meant the getting rid of a periodical cause of fluctuation, and presenting a result, not as it *was* observed, but as it would have been observed, had that cause of fluctuation had no existence.

2. *Equation of time.* In popular language, this expression denotes the difference between the times indicated by an accurately constructed sun-dial and a well-regulated clock. Astronomically, it signifies the difference, expressed in mean solar time, between the true or apparent right ascension of the sun and its mean right ascension. There are only four days in the year, when the apparent and the mean time coincide, and the *equation of time* is nothing, viz. April 15th, June 15th, September 1st, and December 24th. Between April 15th and June 15th, the clock is earlier than the sun, and the *equation is subtractive;* between June 15th and September 1st, the clock is later than the sun, and the *equation is additive.*

EQUA'TION (in Mathematics). An assertion of the equality of two magnitudes, represented by the symbol $=$. It is of two kinds, viz. an *equation of condition*, which will be true only on the supposition of certain conditions, as $2a + 1 = 13$, which requires that a should represent 6; or an *identical equation*, which is true independently of all conditions, *i. e.* whatever may be the value of the symbols employed, as $a + a = 2a$.

EQUA'TION, ALGEBRA'IC. An expression of two algebraic quantities, when connected together by the sign of equality. The *solution* of an equation is the operation by which the values of the *unknown* quantities are found in terms of the *known* quantities. If the equation contains no *power* of the unknown quantities, but these quantities merely in their simplest form, it is called a *simple* equation; if it contains the *square* of the unknown quantity, it is called a *quadratic* equation; if the *cube* of the unknown quantity, a *cubic* equation; if the fourth power, a *biquadratic*, &c.

Equation, Quadratic. This is pure or adfected. 1. *Pure* quadratic equations are those which contain only the *square* of the unknown quantity, as $x^2 = 36$. 2. *Adfected* quadratic equations are those which involve both the *square* and the *simple power* of the unknown quantity, as $x^2 + 4x = 45$.

EQUATION OF PAYMENTS. An arithmetical rule for finding the mean time for paying the amount of several sums which are due at different times. *Rule:*—Multiply each term by its time, and divide the sum of the products by the whole debt; the quotient is accounted the mean time.

EQUA'TOR (*æquo*, to make equal). The Great Circle on the earth's surface, every point in which is equally distant from the poles. It divides the earth into two equal parts, the one being called the Northern, the other the Southern Hemisphere. See *Equinoctial.*

EQUATO'RIAL. An apparatus, formerly called a *parallactic* instrument, used for all those astronomical observations which require an object to be kept long in view. Its value consists in its being capable, when once set upon an object, of following the object for an indefinite period by a *single motion*, i. e. by merely turning the whole apparatus round on its polar axis.

EQUATO'RIAL CURRENT. A drift-current which traverses the Atlantic Ocean, named from its course lying under or near the line. It is supposed to be formed in the Bay of Benin, whence it proceeds westward on both sides of the equator, as far as 22° W. long.; it then declines somewhat southward towards the Brazilian coast, and separates into two currents, called the *Guiana current* and the *Brazil current.*

EQUIA'NGULAR (*æquus angulus*, equal angle). As applied to a single geometrical figure, the term denotes that all its angles are equal, as in all regular polygons; as applied to two figures of the same kind, it denotes that the corresponding angles of the two figures are equal, though, separately, they may not be equiangular figures.

E'QUIDÆ (*equus*, a horse). The Horse tribe; the solidungulous family of pachydermatous animals, with only one apparent toe and a single hoof to each foot.

EQUILA'TERAL (*æqua látera habens*). A term applied to a geometrical figure bounded by equal sides.

EQUILI'BRIUM (*æquè*, equally, *libro*, to poise). A term expressive of the equable diffusion of *temperature* which all bodies on the earth tend to produce; and of the equal distribution of the *electric fluid* in its natural undisturbed state.

Equilibrium of forces. When two forces counteract, or balance each other, they are said to be *in equilibrio.* To produce this state in solid bodies, it is only necessary to support the centre of gravity: a pair of scales are *in equilibrio*, when the beam is in a horizontal position.

EQUIMU'LTIPLES. The products of quantities multiplied by the same number. Thus *six* times A and *six* times B are *equi*-multiples of A and B; m^2np and $m^2\,nq$ are equi-multiples of p and q; a league and a yard are equi-multiples of a mile and a foot.

EQUINO'CTIAL. A synonymous term for the equator, because, when the sun is in the plane of it, *noctes æquantur*, it is equal day and night over the *whole* world.

EQUINO'CTIAL POINTS. The two points of the ecliptic where the equinoctial or equator crosses it; viz., in the first point of *Aries* and the first of *Libra.* The times of the year answering to these points are called *Vernal* and *Autumnal Equinoxes*, the one happening in the spring, the other in the autumn; the vernal being that at which the sun crosses the equinoctial from south to north; the autumnal, when it quits the northern and enters the southern hemisphere. See *Precession.*

EQUISETA'CEÆ. Leafless branched plants, with a striated fistular stem. *Inflorescence* consisting of peltate scales. *Reproductive bodies* in the inside of the lobes of the scales, consisting of four club-shaped bodies, enveloping a naked spore.

EQUISE'TIC ACID. A peculiar acid, existing, in combination with magnesia, in the *Equisetum fluviatile.*

EQUIVALENTS, CHEMICAL (*æquè*, equally, *valeo*, to avail). A term applied by Wollaston to the *combining proportions* of elementary and compound substances, as the quantities of acid and base, in salts, required to neutralize each other. The following are instances of this law:—

Arsenic acid. .	57·68	Lime........	28
Muriatic acid	37	Magnesia...	20
Nitric acid ...	54	Potash	48
Sulphuric acid	40	Soda	32

Thus 57·68 of arsenic acid, 37 of muriatic, 54 of nitric, and 40 of sulphuric, combine with 28 of lime, forming, respectively, a neutral arseniate, muriate, nitrate, and sulphate of lime; &c. &c.

E'QUIVALVED. A term applied to bivalves, when the two valves are of equal size and depth.

EQUI'VOCAL NOUN (*æquè*, equally, *voco*, to call). In Logic, a noun which has more than one signification, each of its significations being *equally* applicable to several objects, as *bull*—the animal; the pope's official letter; a blunder. "Strictly speaking, there is hardly a word in any language which may not be regarded, as in this sense, equivocal; but the title is usually applied only in any case where a word is *employed* equivocally; *e. g.* where the middle term is used in different senses in the two premises; or where a proposition is liable to be understood in various senses, according to the various meanings of one of its terms."—*Whately.*

EQUU'LEUS PICTO'RIS. The Painter's Horse, or Easel; a modern southern constellation, consisting of eight stars, situated close to the principal star of Argo.

E'QUULUS. The Horse's Head; a northern constellation, consisting of ten stars.

E'RA or ÆRA. A fixed point of time, at which the computation of ensuing years is commenced. The following are the principal eras:—

1. *Era of the Olympiads.* The most ancient method of computing time, first instituted in the year B.C. 776, and consisting of a revolution of four years. It originated from the Olympic games, which were celebrated every fifth year at Olympia, a city of Elis in Greece.

2. *Era of the Foundation of Rome.* This has been variously fixed. The Varronian computation, which fixes it in the year B.C. 753, was adopted by the Roman emperors, and has received the sanction of most modern chronologists.

3. *Christian Era.* This commenced Jan. 1, in the middle of the fourth year of the 194th Olympiad, the 753rd of the building of Rome, and the 4714th of the Julian period. The years of this era are described in ancient documents as the years "of Grace," of "the Incarnation," of "the Nativity," of "the Circumcision," and "annus Trabeationis."

4. *Julian Era.* The era of the reformation of the Roman Calendar by Julius Cæsar, who ordained that the year of Rome 707 should consist of 15 months, forming altogether 445 days; that the ensuing year, 708, should consist of 365 days; and that every fourth year should contain 366 days, the additional day being introduced after the 6th of the calends of March, *i.e.* the 24th of February, which year he called *bissextile*, because the 6th of the calends of March was then doubled.

5. *The Indictions.* The Indictions consisted of a revolution of fifteen years, which are separately reckoned as Indiction 1, Indiction 2, &c., up to 15, when they recommence with 1. The first Indiction is usually referred to the year A.D. 313. See *Indictions.*

6. *Mundane Era of Alexandria.* The Alexandrian era of the Creation of the World was fixed at 5502 years before Christ. This computation was continued until A.D. 284, or the year 5786 of the Alexandrian era; but in the following year, ten years were subtracted, and that year was accordingly A. ALEX. 5777.

7. *Mundane Era of Antioch.* By this era, the Creation of the World was fixed at 5492 years before Christ, or ten years later than by the era of Alexandria. As, however, ten years were subtracted from the Alexandrian era in A.D. 285, the two eras thenceforward coincided.

8. *Era of Constantinople.* This era refers the Creation of the World to the 5508th year before Christ, and is still used by the Greek Church. In this era there are two years: the civil, which begins with the month of September; and the ecclesiastical, which commences on the 21st of March, and sometimes on the 1st of April.

9. *Era of the Seleucidæ.* This era, also called the "Era of the Greeks," sometimes the "Era of Alexandria," and occasionally the "Era of the Syro-Macedonians," commenced in the year of Rome 442, twelve years after the death of Alexander, and 311 years and 4 months before the birth of Christ, being the epoch of the conquest of Babylon by Seleucus I., surnamed Nicator, or the Victorious. It is still used in the Levant.

10. *Cæsarean Era of Antioch.* This era was instituted at Antioch, in consequence of the victory gained by Julius Cæsar in the plain of Pharsalia, on the 9th of August, in the year of Rome 706, and 48 years before Christ.

11. *Era of Pisa.* This era, which was sometimes used in France, especially in the twelfth century, differed from our common era by preceding it by one year only.

12. *Era of Spain.* An era founded in consequence of the conquest of Spain by Augustus, in the year of Rome 715, thirty-nine years before the birth of Christ. The era commenced Jan. 1, A.U.C. 716, and 38 B.C. It prevailed in Portugal so lately as 1415, if not until 1422.

13. *Era of Diocletian, or of the Martyrs.* This era dates from August 29, A.D. 284, the day when Diocletian was proclaimed emperor at Chalcedon; and in consequence of his persecution of the Christians, it is also called the "Era of the Martyrs." It was generally used by Christian writers until the introduction of the Christian era in the sixth century, and it is still used by the Ethiopians and Copts.

14. *Era of the Hegira.* This era, also called the "Era of the Turks, Arabs, and other Mahomedans," commences on Friday, July 16, A.D. 622, the day of the flight of Mahomet from Mecca to Medina, which is the date of the Mahomedans; but astronomers and some historians assign it to the preceding day—an important fact, to be borne in mind when perusing Arabian writers.

15. *Era of Abraham.* This era preceded the birth of Christ by 2015 years, and began on the 1st of October, 2016.

16. *Era of Nabonassar.* The author of this era was Nabonassar, the founder of the kingdom of Babylon. It commenced on Wednesday, Feb. 26, in the 3967th year of the Julian period, *i.e.* B.C. 747. It included a period of 424 Egyptian years, from the commencement of Nabonassar's reign to the death of Alexander the Great, and was thence brought down to the reign of Antoninus Pius.

17. *Era of Tyre.* This era began 125 years before Christ, in the year of Rome 628, and in the 186th year of the era of the Seleucidæ.

18. *Actiatic Era.* This era is founded on the battle of Actium, which rendered Augustus master of the Roman empire. The Romans commenced this era on the 1st of January, A.U.C. 724, and in the 16th of the Julian era. In Egypt, it commenced in the same year as that of the battle, and prevailed until the reign of Diocletian. The Greeks of Antioch used it as late as the ninth century.

19. *Era of Augustus.* This was later by four years than the Actiatic era, and began in the year of Rome 727, twenty-seven years before the Christian era.

20. *Era of the Ascension.* This era is supposed to have been used only by the author of the Chronicle of Alexandria, who dates the year of the Martyrdom of St. Menas of Cotys at the period corresponding with the 12th of November, A.D. 295.

21. *Era of the Armenians.* This era commenced on Tuesday, July 9th, A.D. 552, the period when the Council of Tiben, or the Armenians, confirmed the condemnation of the Council of Chalcedonia, which was pronounced in A.D. 536, and by which they completed their schism.

22. *Era of Yezdegird III., or the Persian Era.* This era commenced on the accession of Yezdegird to the throne of Persia, on the 16th of June, A.D. 632.

23. *Jewish Era.* This era is commonly supposed to be not more ancient than the fifteenth century. The Jews now date from the creation of the world, which they consider to have taken place 3760 years and 3 months before the commencement of the Christian era.

24. *Era of the Caliyug.* This is the most ancient era of India, and dates from a period 3101 years before Christ. Other eras are used in different parts of India, as those of Salivahana, of Vicramaditya, of Parasurama, &c.

25. *Era of the French.* The era of the National Convention, which commenced on the 22nd of September, 1792, being the epoch of the foundation of the Republic; but its establishment was not decreed till the 4th "Frimaire" of the year II. (Nov. 24, 1793.) Two days afterwards the public acts were thus dated. This calendar existed till the 10th "Nivose," of the year XIV. (Dec. 31, 1805,) when the Gregorian mode of computation was restored.

E'REMACAU'SIS (ἤρεμος, slow, καῦσις, burning). A term applied by Liebig to the slow combustion or oxidation of organic matters in air, as the conversion of wood into humus, the formation of acetic acid from alcohol, nitrification, &c.

ERICA'CEÆ (*erica*, a heath). The Heath tribe of Dicotyledonous plants. Shrubs, with *leaves* evergreen, rigid, entire, whorled or opposite; *flowers* monopetalous, regular; *stamens* definite; *ovarium* superior, many-seeded; *seeds* apterous.

ERI'DANUS. A southern constellation, consisting of 84 stars, the principal of which is Achernar.

ERINACE'ADÆ. The Urchin or Hedgehog tribe; a family of insectivorous vertebrata, which are remarkable not only for their covering of spines, but for the great development of the muscular envelope of the body immediately beneath the skin.

E'RINITE. A beautiful emerald-green arseniate of copper, named from its being found in the county of Limerick in Ireland.

ERIO'METER (ἔριον, wool, μέτρον, a measure). An instrument, invented by Dr. Young, for the purpose of measuring the diameters of minute fibres.

E'RLAMITE. A new mineral, forming a part of the oldest gneiss formation.

ERO'SE (*erosus*, gnawed off). Gnawed; having the margin irregularly divided, as if bitten by an animal: a term applied to the margin of certain leaves.

ERRA'NTES (*erro*, to wander). A term applied by M. Edwards to an order of the *Anellida*, which are at once the highest organized and the most locomotive. These are the *dorsibranchiata* of Cuvier, and are commonly known by the names of sea-centipedes, sea-mice, or nereids.

ERRA'TIC BLOCKS. A term synonymous with *boulders*, derived from their wide distribution over the surface of the earth. See *Boulders*.

ERY'THRO- (ἐρυθρὸς, red). A Greek term employed in composition to denote any pure *red* colour. It agrees with the *ruber* of the Latins.

1. *Erythric Acid.* A red substance produced by the mutual action of the nitric and uric acids. Dr. Prout considers it to be not a peculiar acid, but a compound of nitric and purpuric acid and ammonia.

2. *Erythrin.* One of a series of substances including erythrilin, erythrin bitter or amarythrin, telerythrin, &c., obtained by Dr. Kane from the *Roccella tinctoria*.

3. *Erythro-gen* (γεννάω, to produce). A green-coloured substance found in the gall-bladder, in a case of jaundice. It unites with nitrogen, and produces a red compound.

4. *Erythro-phylle* (φύλλον, a leaf). A term applied by Berzelius to the red colouring matter of leaves and fruits in autumn.

5. *Erythro-stomum* (στόμα, a mouth). A term applied by Desvaux to the aggregate fruit, more generally termed *etærio*.

ESCA'RPMENT (*escarper*, to cut steep). The abrupt face of a ridge of high land, where subjacent strata are observed to "crop out."

ESO'CIDÆ (*esox*, the pike). The Pike tribe; a family of *Malacopterygious* or soft-spined fishes, having the ventral fins placed under the abdomen, and including most of the voracious fresh-water fishes, as well as several important marine species. They are distinguished by the position of the dorsal opposite to the anal fin, and by the absence of fatty matter in the former.

ESOTE'RIC (ἐσωτερικὸς, inner). A term applied to the disciples of Pythagoras, Aristotle, &c., who were *scientifically taught*, as distinguished from the *exoteric*, who had merely popular views. The term *esoteric* is sometimes applied to a mysterious doctrine, which was taught only to the more enlightened, and was thus distinguished from the *exoteric*, or *published* doctrine. In this sense "esoteric" is synonymous with *acroamatic*, or that which is communicated by oral instruction.

E'SSENCE (*essentia*, a being). A scholastic term denoting the essential perfection of a being, *i. e.* its entity and attributes. It sometimes signifies merely the principal attributes of a being.

ESSENTIAL DEFINITION. In Logic, a definition which assigns, not the properties or accidents of the thing defined, but what are regarded as its essential parts, whether physical or logical. See *Definition*.

ESSENTIAL OILS. Oils obtained by distillation from odoriferous vegetable substances. Several of the volatile or essential oils are called *essences*.

ESTIVA'TION (*æstivus*, belonging to summer). *Præfloration.* A botanical term applied to several modes in which the floral envelopes are folded up in the unexpanded or *bud* state. It is said to be—

1. *Involute*, when the edges are rolled inwardly spirally on each side.

2. *Revolute*, when the edges are rolled backwards spirally on each side.

3. *Obvolute*, when the margins of one leaf alternately overlap those of the opposite leaf.

4. *Convolute*, when one leaf is wholly rolled up within another leaf.

5. *Supervolute*, when one edge is rolled

inwards, and is enveloped by the opposite edge rolled in an opposite direction.

6. *Induplicate*, when the margins are bent abruptly inwards, and the external face of these edges is applied to each other without any twisting.

7. *Conduplicate*, when the sides are applied parallelly to the faces of each other.

8. *Plaited*, when they are folded lengthwise, like the plaits of a closed fan.

9. *Replicate*, when the upper part is curved back and applied to the lower.

10. *Curvative*, when the margins are slightly curved, either backwards or forwards, without any sensible twisting.

11. *Wrinkled*, when the parts are folded up irregularly in every direction.

12. *Imbricated*, when they overlap each other parallelly at the margins, without any involution.

13. *Equitant*, when they overlap each other parallelly and entirely, without involution, as in iris.

14. *Reclinate*, when they are bent down upon their stalk.

15. *Circinate*, when they are rolled spirally downward.

16. *Valvate*, when they are applied to each other by the margins only.

17. *Quincuncial*, when the pieces are five in number, of which two are exterior, two interior, and the fifth covers the interior with one margin, and has its other margin covered by the exterior, as in the rose.

18. *Twisted*, which is the same as *contorted*, except that there is no obliquity in the form or insertion of the pieces.

19. *Contorted*, when they are twisted in such a manner that each piece of a whorl overlaps its neighbour by one margin, and is overlapped by its other neighbour by the other margin.

20. *Alternative*, when the pieces being in two rows, the inner is covered by the outer in such a way that each of the exterior rows overlaps half of two of the interior, as in liliaceæ.

21. *Vexillary*, when one piece is much larger than the others, and is folded over them, they being arranged face to face, as in papilionaceous flowers.

22. *Cochlear*, when one piece, being larger than the others, and hollowed like a helmet or bowl, covers all the others, as in aconite, some species of personate flowers, &c.—*Lindley*.

ESTUARIES (*æstus*, the tide). Inlets of the land, which are entered by tides of the sea and by rivers. They occur in the Thames, the Severn, the Tay, &c.

ETÆ'RIO (ἐταιρεία, an association). A term applied by Mirbel to an aggregate fruit, the separate parts of which are achænia, as in ranunculus, rubus, &c.

ETE'SIAN WIND (ἐτήσιος, annual). A northerly or north-easterly wind which prevails very much in summer all over Europe. See *Winds*.

E'THAL. A peculiar oily substance, obtained from spermaceti; also termed hydrate of oxide of cetyl. The term is formed of the first syllable of the words *eth*er and *al*cohol, on account of its analogy to these liquids in point of composition.

ETHER (αἰθὴρ, ether). An imaginary fluid, supposed by some philosophers to fill all space beyond the atmospheres of the earth and other planets.

ETHER (in Chemistry). A very volatile fluid, produced by the distillation of alcohol with an acid. It is sometimes distinguished as *sulphuric ether*, from the mode of preparing it; but when well rectified, the ether is the same, whatever acid has been employed.

ETHE'REUM (αἰθὴρ, ether). A hypothetical carburetted hydrogen, so named by Dr. Kane, and identical with the *ethule* of Berzelius. *Etherine* is a peculiar carburetted hydrogen, which has also been regarded as the basis of ether.

ETHE'RIDÆ. River Oysters; a family of the atrachian bivalves, named from the genus *etheria*.

E'THICS (ἠθικὸς, belonging to morals). The science of Morals, or those affections of the mind which develop themselves in action. Aristotle derives the word from another, which signifies *habit* (ἠθικὴν ἀπὸ τοῦ ἔθους), moral disposition being formed upon habit.

ETHIO'NIC ACID (αἰθὴρ, ether, θεῖον, sulphur). *Ethero-sulphuric acid.* An acid produced by the action of the vapour of anhydrous sulphuric acid upon absolute alcohol kept cold.

ETHIOPIAN or NEGRO RACE. One of the five principal races of mankind, in which the head is narrow and compressed at the sides, the forehead very convex, the cheek-bones projecting *forwards*, the nostrils wide, the jaws lengthened, the skull in general thick and heavy, the face narrow, projecting *towards the lower* part, the nose spread and almost confounded with the cheeks, the lips, particularly the upper one, very thick.

ETHNO'GRAPHY (ἔθνος, a race, γράφω, to describe). A historical investigation into the origin, migrations, and connexion of various peoples. In this sense, ethnography is purely of a historical character, and may be considered as distinct from *anthropography*. A series of anthropographies, of different epochs, would form the true basis of ethnography.

ETHU'LE (αἰθὴρ, ether, ὕλη, matter). A hypothetical radical, existing in ether and its compounds; ether being the oxide of ethule, and alcohol the hydrated oxide of ethule.

ETIOLATION. The process of blanching plants, as celery, kale, &c., by sheltering them from the action of light. The natural colour of the plants is thus prevented from being formed.

ETYMO'LOGY (τὸ ἔτυμον, the derivation of a word from its root, λόγος, an account). That part of Grammar which treats of the formation of words. Under this general definition are included the classification of words, the various modifications they undergo to express different meanings, and their origin and history.

EUCHLORINE (εὖ, brilliant, χλωρὸς, green). The name given by Davy to the protoxide of chlorine, from its being considerably more brilliant than simple chlorine.

EU'CHRONIC ACID (εὔχροος, of a fine colour). An acid procured by the decomposition of the neutral mellitate of ammonia by heat. It forms a blue compound with zinc, called *euchrone*.

EU'CLASE (εὖ, well, κλάω, to break). Prismatic emerald; a beautiful mineral found in Peru and Brazil.

EUDI'ALITE. A brownish-red mineral, belonging to the tessular system of Mohs.

EUDIO'METER (εὐδία, calm weather, μέτρον, a measure). An instrument for ascertaining the purity of the air, or, rather, the proportion of oxygen contained in a given gas.

EUKAIRITE. A new mineral found in the copper mine of Skrickerum, and consisting of silver, selenium, copper, and alumina.

EUPHE'MISM (εὐφημία, the use of words of good omen). A mild name for a bad thing; a rhetorical figure employed to prevent giving offence to "ears polite," and adopted, in daily use, in deference to the fastidiousness which prevails on certain points: "Strabonem
Appellat *Pætum* pater; et *Pullum*, male parvus
Si cui filius est," &c.

EU'PHONY (εὐφωνία, goodness of voice). An agreeable quality of language arising from the harmonious combination of sounds. It consists in an uninterrupted flow of words, which neither impedes the speaker's utterance, nor offends the hearer's ear; and is opposed to *cacophony*, or a harsh and disagreeable style.

EUPHORBIA'CEÆ. The Euphorbium tribe of Dicotyledonous plants. Trees, shrubs, and herbaceous plants, with *leaves* alternate; *flowers* apetalous, unisexual; *ovarium* three-celled, the cells separating with elasticity from their common axis.

EU'PHOTIDE. A rock consisting essentially of felspar and diallage, aggregated together in the manner of granite. The Italian artists call it gabbro.

EUPION (εὖ, well, πίων, fat). A colourless liquid, obtained by distillation from the tar of animal matters, and so named from its great limpidity.

EUPY'RION (εὖ, easily, πῦρ, fire). Any contrivance for obtaining an instantaneous light, as the phosphorus bottle.

EURITE, or WHITESTONE. A variety of granite, in which felspar is the predominant ingredient; or in which all the ingredients are blended into a finely granular mass of a white appearance.

EVAPORA'TION. 1. *Spontaneous evaporation* is the production of vapour by some natural agency, without the direct application of heat, as on the surface of the earth or ocean. This is commonly termed *exhalation*. 2. The chemical operation is usually performed by applying heat to any compound substance, in order to separate the volatile parts, which are dissipated and lost. In this respect, evaporation differs from distillation, which chiefly consists in preserving the volatile parts.

EVE'CTION (*eveho*, to raise up). A term applied to certain irregularities, consisting of elongations or contractions, of the moon's orbit. They depend upon the varying attraction exercised by the earth upon the moon, according as the latter is in apogee or perigee, and as consequently more or less under the influence of the sun's attraction. They are periodical, running through all their changes in about twenty-seven days. See *Angle of Evection.*

EVERGREEN. A term applied to plants which have persistent or perennial leaves; *i. e.* leaves which remain perfect upon the plant beyond a single season, as holly, common laurel, &c.

EVERLASTING FLOWERS. A popular designation of certain flowers which retain their colour for many months after they have been gathered, owing to the hardness of their tissue, and the small amount of moisture which they contain.

E'VOLUTE (*evolutus*, unrolled). A curve from which any given curve may be supposed to be formed by the *evolution* or unlapping of a thread from a surface having the same curvature as the first curve. See *Curve.*

EVOLUTION (*evolvo*, to roll out). A term applied to a theory of non-sexual generation, according to which the first created embryos of each species must contain within themselves, as it were in miniature, all the individuals of that species which shall ever exist; and must contain them so arranged, that each generation should include not only the next, but, encased within it, all succeeding generations. Hence this theory has also received the name of the *emboitement* theory. Compare *Epigenesis.*

EVOLU'TION (in Algebra). The *extraction of roots*, or the method of finding a quantity, which, raised to a proposed power, will produce a given quantity. It is just the reverse of *involution;* and to perform the operation, we must inquire what quantity multiplied into itself, till the number of factors amounts to the number of units in the index of the given root, will generate the quantity whose root is to be extracted.

EXCENTRICITY (ἐξ, out, κέντρον, centre). The ratio which the distance between the centre and focus of an ellipse or hyperbola bears to the whole semi-axis. Half the distance between the *foci* of an ellipse is called its excentricity, and sometimes its *ellipticity.* It is in this way that we speak of the *excentricity* of the orbits of the planets which are supposed to move in ellipses; the circle which circumscribes the elliptic orbit of a planet being called the *excentric.* Hence, the *excentric anomaly* is the arc of the excentric between the perihelion of the orbit, and the straight line drawn through the centre of the planet perpendicular to the major axis. See *Anomaly.*

EXCHANGES, THEORY OF. A theory introduced by Prevost for explaining the equilibrium of temperature of any body. It is founded on the supposition that the quantity of heat which the body diffuses by radiation, is equal to that which it receives by radiation from surrounding objects, and which it either wholly or in part absorbs.

EXCI'PULUS. That part of the thallus which forms the rim and base of the shields of lichens.

EXCITATION OF ELECTRICITY. The disturbance of the electric equilibrium by friction, elevation of temperature, contact, &c. Bodies have been distinguished into *conductors* and *non-conductors*, according to the facility with which the electric influence passes, or is conducted, along their surfaces.

EXCITO-MOTORY. A designation of that function of the nervous system, discovered by Dr. Marshall Hall, by which an impression is transmitted to a centre, and *reflected* so as to produce contraction of a muscle, without sensation or volition.

EXCU'RRENT (*excurro*, to run out). A term applied to that mode of ramification in plants, in which the axis remains always in the centre, all the other parts being regularly disposed around it, as in pinus abies.

EXCURTRI'CES (*excurro*, to rush hastily). Snatchers; a name given by Macgillivray to an order of Birds, intermediate between the flying and walking tribes, and belonging to the *Insessores* of other writers. They include the shrikes and fly-catchers, the thick-bills and the rollers.

EXHALATION. A general term for all the effluvia or steams raised from the surface of the earth in form of vapour. Some distinguish exhalations from vapours, expressing by the former all steams emitted from solid bodies, and by the latter, the steams raised from water and other fluids.

EXI'NTINE. A term applied by Fritzsche to a third membrane situated between the *extine* and the *intine*, in the pollen of yew, juniper, cypress, &c.

EXO- (ἔξω). A Greek adverb, signifying *without, on the outside*, &c.

1. *Exo-genous* (γείνομαι, to be produced). Outside-growing; increasing in diameter by deposition to the exterior: a term applied to the structure of the axis of dicotyledonous plants, in which the newest-formed fibres are deposited on the exterior of those previously formed,

exhibiting, on a transverse section, a series of concentric circles or zones.

2. *Exo-phyllous* (φύλλον, a leaf). A term applied by Dumortier to the exorrhizous embryo, in consequence of the cotyledons being always naked, *i. e.* not evolved from a coleophyllum or leaf-sheath.

3. *Exo-ptile* (πτίλον, a feather). A term applied by Lestiboudois to the dicotyledonous embryo, in consequence of its plumule being naked, *i. e.* not enclosed within the substance of the cotyledons.

4. *Exo-rrhizous* (ῥίζα, a root). A term expressive of the mode of germination in exogenous plants, in which the radicle appears at once on the surface of the radicular extremity of the cotyledons, and consequently has no coleophyllum or sheath at its base, as occurs in the endorrhizous germination.

5. *Ex-osmose* (ὠσμὸς, impulsion). The property by which a rarer fluid passes through membranous substances out of a cavity into a vessel containing a denser fluid.

6. *Exo-stome* (στόμα, a mouth). The foramen or orifice of the outer integument, or primine, of the ovule in plants.

7. *Exo-thecium* (θήκη, a case). A term applied by Purkinje to the coat of the anther, in plants.

EXOCHNATA (ἔξοχος, prominent). A designation of the long-tailed Crustacea, as the lobster and shrimp.

EXOTE'RIC (ἐξωτερικὸς, external). A term applied to those disciples of Pythagoras and others, who were not yet initiated into their highest philosophy; as distinguished from the *esoteric*, who were scientifically taught. The term "exoteric" was also applied to those writings which were in a more popular form, while the "esoteric" writings were of a more scientific and exact character.

EXPANSIBI'LITY (*expando*, to spread out). That property of a body by which it is capable, under certain circumstances, of occupying more space than it usually requires. The principal agent in the expansion of bodies is *caloric*.

EXPERIMENTUM CRUCIS. A *crucial* or decisive experiment in attempting to interpret the laws of nature; so called, after Bacon's manner, from the crosses, or way-posts, used to point out roads, because they determine at once between two or more possible conclusions.

EXPLOSION. The sudden and violent expansion of the constituent parts of a body.

EXPO'NENT (*expono*, to explain). A small figure, or other symbol, placed at the right hand of an algebraical quantity, to express its *power*. It is equivalent to the number of factors, and is also called the *index* of the power. Thus, in the expression a^2, the figure 2 is the index or exponent, and denotes that the quantity is the square of a.

1. *Exponent of a rank*. The number or place of any term in a series: thus, in the series 1, 3, 5, 7, 9, 11, 13, 15, &c., 7 is the exponent of the rank of 13, this term being the 7th in the order of the series.

2. *Exponent of a geometrical ratio*. The quotient which arises from dividing the consequent by the antecedent of the ratio. Thus, in the ratio of 2 to 8, the exponent is $\frac{8}{2} = 4$; and, in the ratio of 8 to 2, the exponent is $\frac{2}{8} = \frac{1}{4}$. Some mathematicians, however, consider logarithms as the exponents of ratios.

EXPONE'NTIAL. This term is variously applied. The *exponential calculus* is that part of Algebra which relates to *exponential quantities*, or quantities raised to powers of which the exponents are indeterminate or variable. An *exponential curve* is a curve defined by an *exponential equation*, or an equation which contains an exponential quantity. Exponential equations are commonly resolved by means of logarithms.

EXSERTED (*exsertus*, thrust out). A term applied to the stamens of plants, when they are longer than the corolla.

EXSICCA'TION (*exsicco*, to dry up). A variety of evaporation, producing the expulsion of moisture from solid bodies by heat, and generally employed for depriving salts of their water of crystallization.

EXTENSION (*extendo*, to stretch out). That property of matter by which it occupies space: it relates to the qualities of length, breadth, and thickness, without which no substance can exist; but has no respect to the size or shape of a body. This property is termed, in common language, *size* or *volume*.

EXTINE (*extimus*, outermost). The outermost membrane of the pollen-grain in plants.

EXTRA'CTION OF ROOTS. The arithmetical or algebraical operation of finding the *root* of a number or quantity; in other words, the finding that number or quantity which, multiplied into itself a certain number of times, will produce the given number or quantity. See *Evolution*.

EXTREME AND MEAN RATIO. A straight line is said to be divided in *extreme and mean ratio*, when the whole is to the greater part as the greater part to the less; or when the rectangle contained by the whole line and the smaller segment is equal to the square of the greater segment.

EXTRE'MES (*extremus*, last). In Logic, the subject and predicate of a proposition are called its *extremes* or *terms*, being, as it were, the two boundaries, having the copula (in regular order) placed between them. In speaking of a syllogism, the word is often understood to imply the extremes *of the conclusion*.

EXTRORSE (*extrorsum*, towards the outside). Turned outwards; turned away from the axis to which it belongs; a term applied, in botany, to those *anthers*, whose line of dehiscence is towards the petals. Brown uses the term *posticæ* in this sense.

EXU'VIÆ (*exuo*, to put off). The slough, or cast-off covering of certain animals, as the skins of the serpent and the caterpillar. This term relates, however, in geological language, not only to the rejected envelopes of animals, but to fossil shells and other remains which have been left by animals in the strata of the earth.

EXUVIA'TION (*exuviæ*, a slough, the cast-off skin of certain animals). A term applied, in Zoology, to the process by which the crustaceous animals throw off their old shell, and form a new one.

F

FA'CET. A term derived from the French, denoting a flat surface, with a definite boundary. The English term *face* has the same meaning in Geometry, and is applied to the plane which forms one of the surfaces of a polyhedron.

FACIAL ANGLE. This angle is measured by drawing a line from the prominent centre of the forehead to the most advanced part of the lower jaw-bone, and observing the angle which it makes with the horizontal line. By measurement of this angle it has been affirmed that a scale might be traced from "apes with foreheads villainous low" to the African variety of the human species, and from that to the European.

FACTITIOUS (*factito*, to practise). Made by art, as factitious cinnabar, in distinction from the natural production. This term is also applied to *waters* prepared in imitation of natural waters, as those of Brighton.

FA'CTOR. A term applied in Algebra to each of the quantities which are multiplied into one another in order to form (*facere*) a product, *i. e.*, to the multiplier and the multiplicand; thus a and $a + x$ are the factors of the product $a\,(a + x)$, or $a^2 + ax$ Factors are also called *divisors*, especially in speaking of a number, which is regarded as the product of several others.

Factorial expression. A term sometimes applied to an expression of which the factors are in arithmetical progression, as—

$$(x + 1)\ (x + 2)\ (x + 3)\ (x + 4).$$

FA'CULA (dim. of *fax*, a torch). A little torch. The term *faculæ* is applied to certain luminous spots on the surface of the sun; they are of irregular form, of variable duration, and are commonly surrounded by a penumbra. By such spots the diurnal revolutions of the planets, as well as that of the sun, have been determined.

FAHLERZE. *Fahlore*. A grey copper ore, comprising the *arsenical* and the *antimonial* varieties. In this, and in several other double sulphurets of silver and other metals, the sulphuret of silver and the sub-sulphuret of copper, being isomorphous, replace each other in indeterminate proportions.

FA'HLUNITE. *Automalite*. A subspecies of octohedral corundum, found in a talcose rock, at Fahlun in Sweden.

FA'LCATE (*falx*, a scythe or sickle). Sickle-shaped; any thing plane and curved, with parallel edges. The moon is said to be *falcate*, when the enlightened part appears in the form of a crescent. In Zoology, a part is said to be falcate, when it is curved with the apex acute.

FALCO'NIDÆ. The Falcon tribe; a family of the *Raptores*, or Rapacious birds, distinguished from the Vultures by their shorter, sharper, and notched bill, and by the sharpness and curvature of their retractile talons. The falcons have been divided into the *noble*, or *falcons proper*, capable of being trained to the sport of falconry, and the *ignoble*, which are incapable of this training. This family includes the eagle, the hawk, the kite, the osprey, &c.

FA'LLACY (*fallacia*, deceit). In Logic, "an unsound mode of arguing, which appears to demand our conviction, and to be decisive of the question in hand, when in fairness it is not." Fallacies are of two kinds:—

1. *Logical Fallacies*, or fallacies "in dictione," in which the fault is in the *reasoning*, and in that alone, the conclusion not following from the premises; as in the indistributed middle, illicit process, negative premises, or affirmative conclusion form a negative premiss, and *vice versâ*.

2. *Non-logical fallacies*, or fallacies "extra dictionem," in which the fault is in the *matter*. Of these there are two kinds; viz. 1st, when the *premises* are such as ought not to have been assumed; 2nd, when the *conclusion* is not the one required, but irrelevant. To this head belong the fallacies of "non causa pro causa," "petitio principii," &c.

FALSE. This term, in its strict logical sense, denotes the *quality of a proposition* which states something not as it is. Logicians express this quality of a proposition by the word *falsity*, as being more precise than the word *falsehood*, which is opposed not merely to logical, but also to moral truth.

FALSE CADENCE. In Music, a cadence in which the base rises a tone or semitone, instead of rising a fourth or falling a fifth.

FALSE POSITION. A rule in arithmetic, according to which, by false or supposed numbers, taken at pleasure, the true required number is discovered. There are two methods: by *single position*, one supposed number is used, and, by working with this as the true one, the real number required is found; by *double position*, two supposed numbers are used, and if both prove false (as it generally happens), they are subjected to further arithmetical investigation.

FALSE'TTO. An Italian term, applied in Music to a false or artificial voice, by which the vocal compass is extended, by contracting the aperture of the throat, several notes above the natural voice. The Italians call the falsetto *voce di testa*, or voice from the head; the natural voice, *voce di petto*, or voice from the chest.

FALUNS. A French provincial name for some tertiary strata, abounding in shells, in Touraine, which resemble in lithological characters the "Crag" of Norfolk and Suffolk.

FAMILY. In classifications of Zoology, Botany, &c., this term denotes the group next in value and comprehensiveness above the *genus*. As species constitute a genus, so genera constitute a family, or order.

FARI'NA (*far*, *farris*, corn). Meal, or vegetable flour, made from the seed of the Winter Wheat. See *Amylum*.

Farinaceous. A term for all those substances which contain farina; viz. the cerealia, legumes, &c.

FA'SCIÆ (*fascia*, a band). Stripes or belts observed on the disc of Jupiter and other planets. In Botany, contiguous stems or fruits, which have grown unnaturally together, are said to be *fasciated*.

FA'SCICLE (*fasciculus*, a little bundle). A form of inflorescence resembling a corymb, but having a centrifugal, instead of a centripetal, expansion. It is a kind of *compound corymb*.

FASCI'CULATE (*fasciculus*, a little bundle). Clustered; as when several bodies spring from a common point, as the leaves of larix, the tubers of orchis, the roots of commelina, &c.

FASTI'GIATE (*fastigium*, the top of any thing). A term used in Botany to denote that the branches of a tree are appressed to the stem, assuming nearly the same direction, as in populus fastigiata.

FA'TA MORGA'NA. *Castles of the Fairy Morgana*. A meteorological phenomenon occasionally witnessed in the Straits of Messina, and depending on *unusual refraction*. The images of men, of buildings, and other objects are seen from the coast, sometimes in the water, sometimes at the surface of the water, or in the air: there may be two images of the same object, the one in a natural, the other in an inverted position; or the images of the same object may be multiplied to a great degree.

FAULT. A technical term applied by miners to a sudden interruption of the continuity of strata in the same place, accompanied by a crack or fissure, varying in width from a mere line to several feet, which is generally filled with broken stone, clay, and other materials. The displacement of the strata is owing to the upheaving on the one side, or to subsidence on the other side, of the fault.

FAUNA (*Fauni*, the rural divinities). A term denoting the animals peculiar to any particular country.

FAUX. The throat; the orifice of the tube of a gamopetalous corolla.

FAVOSE (*favus*, a honey-comb). Honey-combed; excavated like a honeycomb, as the receptacle of onopordum, the seeds of poppy, &c.

FE'CULA (*fæx*, the grounds or settlement of any liquor). Originally, any substance derived by spontaneous subsidence from a liquid; the term was afterwards applied to *starch*, which was thus deposited by agitating the flour of wheat in water; and lastly, it denoted a peculiar vegetable principle, which, like starch, is insoluble in cold, but completely soluble in boiling water, with which it forms a gelatinous solution.

FECUNDATION (*fecundo*, to make fruitful). *Impregnation.* The effect of the vivifying fluid upon the germ or ovum, which is then called the *embryo.*

FE'LIDÆ (*felis*, a cat). The Cat tribe; a family of carnivorous Vertebrata, characterized by their short powerful jaws, retractile claws, and the peculiar adaptation of their teeth for cutting. They are, among the quadrupeds, what the *Falconidæ* are among Birds.

FELLOWSHIP. A rule in arithmetic, by which profit or loss is divided between two or more partners, in proportion to the principal of each in joint stock. The rule is applicable to cases in which the investments are made for the same time, and to cases in which the partners employed their principal at different times: the former belong to the rule of *fellowship without time;* the latter, to that of *fellowship with time.*

FE'LSPAR. A simple mineral which, next to quartz, constitutes the chief material of rocks. The white angular portions of granite consist of felspar. This mineral always contains some alkali in its composition: in *common felspar* the alkali is potash; in the variety called Albite or Cleavlandite, it is soda. The term *glassy felspar* denotes that the crystals have a high degree of transparency. *Compact felspar* appears to contain both potash and soda. See *Adularia.*

Felspar-porphyry. A felspathic rock, in which crystals of felspar are mixed with hornblende, mica, or quartz.

FELSPA'THIC ROCKS. Rocks of which *felspar* is the chief constituent, comprising granite, gneiss, claystone, lava, and other varieties.

FENE'STRATE (*fenestra*, a window). Windowed; a term applied to the incomplete dissepiment sometimes occurring in the siliqua of cruciferous plants.

FE'RGUSONITE. A crystallized mineral, occurring principally as a columbate of yttria. It has been found only in Greenland, near Cape Farewell, imbedded in quartz.

FE'RMENT (*fermentum*, quasi *fervimentum*, from *ferveo*, to work). A substance which possesses the power of commencing fermentation. It is either naturally present, as in the grape, or is added, as in the case of yeast.

FERMENTATION. Certain changes of animal or vegetable substances, reduced to the moist or liquid state by water. There are several kinds:—

1. The *Saccharine;* when the change terminates in sugar, as that of starch.

2. { The *Panary*; as that of flour forming bread:—or
The *Vinous;* as that of the grape, &c., forming wine;—
evolving alcohol.

3. The *Acetous;* when the result is acetic acid, or vinegar.

4. The *Putrefactive;* generally of animal substances, evolving ammonia.

5. The *Lactic;* when no alcohol is evolved, but the liquid becomes mucilaginous and thick, with the production of mannite and lactic acid.

FE'RRIC OXIDE (*ferrum*, iron). Peroxide of iron; a mineral occurring abundantly in nature, as *oligistic* or *specular iron*, forming the celebrated Elba ore; as *red hematite*, which is cut, and forms the burnishers of bloodstone; and in combination with water, as *brown hematite*, employed in most of the iron furnaces of France.

1. *Ferroso-ferric Oxide.* The black oxide, magnetic oxide of iron, or martial ethiops. It occurs in the mineral kingdom, under the name of *magnetic iron-ore*, the massive form of which is called *native loadstone.*

2. *Ferroso-ferric Sulphate.* The name given by Berzelius to a combination of the proto- and per-sulphates of iron.

FERRI'FEROUS ROCKS (*ferrum*, iron, *fero*, to bear). Rocks in which *iron-ore* is abundantly distributed, comprising clay iron-ore and iron pyrites.

FERROCYA'NIC ACID. *Ferrocyanide of Hydrogen.* A compound of cyanogen, metallic iron, and hydrogen; also called *ferruretted chyazic acid.* It contains the elements of hydro-cyanic acid, but differs from it totally in its properties. Its salts, formerly called *triple prussiates*, are now termed *ferro-cyanides*. The beautiful pigment *Prussian blue* is a ferro-cyanide of the peroxide of iron.

FERRU'GINOUS (*ferrugo*, quasi *ferri ærugo*, rust of iron). Containing iron, or of the nature of iron, as certain salts, mineral waters, &c. The term *ferrugo* is applied, in Botany, to a disease of plants, commonly called *rust*, and occasioned by the presence of minute fungi, chiefly of the genus *uredo*.

FERTILIZA'TION (*fertilis*, fertile). The function of the pollen of plants upon the pistil, by means of which the *ovules* are converted into *seeds*.

FETTSTEIN (German, *fat stone*). A designation of a sub-species of pyramidal felspar, from its resinous nature. The term is synonymous with *elaolite*, which means *oil-stone*.

FIBRE (*fibra*, a filament). A filament of thread, of animal, vegetable, or mineral composition. A *fibril* is a minute subdivision of a fibrous root.

FI'BRIN (*fibra*, a fibre). A principle found in vegetables as a constituent of gluten; and in the living blood of animals, constituting muscular fibre.

FI'BROLITE. A mineral of a peculiar fibrous texture, found in the Carnatic, and consisting of alumina, silica, and iron.

FIBROUS (*fibra*, a fibre or thread). Consisting of or resembling fibres; as indicating the structure of a shell when fractured.

FI'BROUS COAL. A variety of glance-coal, distinguished by its fibrous concretions and silky lustre. It occurs in the coal-fields of Great Britain.

FIELD OF VISION. A technical expression for the space or range seen through a telescope. It is measured by dividing the angle under which it is seen by the angle of vision of the naked eye embracing the same field within its view. The greater the magnifying power of the instrument, the less will be the angle of vision of the naked eye, compared with that of an eye looking through the glass.

FIFTH. An interval in Music, occurring in the natural scale, in the fifth place from the fundamental. The *false fifth* is less than the fifth by a lesser semitone.

FIFTEENTH. In Music, an interval of two octaves. The *fifteenth stop* in organs is a double octave above the diapason.

FI'GURATE NUMBERS. Certain series of numbers deduced from any progression, by taking the sum of the first two, the first three, the first four, &c., terms of the progression, and then operating on the series thus obtained, in order to obtain a new series, and so on. For example:—

A......1, 2, 3, 4, 5, 6, 7,
B......1, 3, 6, 10, 15, 21, 28,
C......1, 4, 10, 20, 35, 56, 84,
D......1, 5, 15, 35, 70, 126, 210.

1. The series A is the arithmetical progression from which the other series are deduced. The series B consists of *triangular* or *polygonal* numbers of the preceding progression, so named from certain analogies which the numbers so denoted have with the geometrical figures bearing the same denominations. The series C consists of triangular *pyramidal* numbers, and is formed from the preceding series in the same way as this from the original progression. The series D consists of *second pyramidals*, and is formed like the preceding series.

2. If the common difference of the first progression were 2, the successive series would consist of *square* numbers; if the common difference were 3, the series would be *pentagonal* numbers; if 4, *hexagonal* numbers, and so on; the numbers thus obtained being capable of being placed in the form of squares, pentagons, hexagons, &c.

FIGURE. Figure, or *form*, is a property of bodies, resulting from extension. The *volume* of a body has no relation to its *figure:* bodies which have the same figures may possess very different volumes; and bodies may have the same volume under very different figures; thus, two masses of matter may present the same volume, although the one be round and the other square.

FIGURE (in Geometry). A finite space, bounded on all sides by lines or by planes. The term is also employed as synonymous with *diagram*.

FIGURE, APPARENT. A term in Optics, denoting the figure under which an object presents itself to the eye. As this depends on the situation of the points from which the rays of light pass to the eye, the *apparent* figure may be very different from the *real* figure of an object; a straight line, for instance, may appear as a point, a plane as a straight line, and a solid as a simple surface.

FIGURE OF A SYLLOGISM. A logical expression, denoting the situation of the middle term with respect to the extremes of the conclusion (*i. e.* the major and the minor term). The *figures* of reasoning are only *different forms* of stating it.

FI'LAMENT (*filamentum*, a little thread). The thread-like portion of the stamen, which supports the anther.

FI'LICES (*filix*, a fern). The Fern tribe of Acotyledonous plants. Leafy plants, producing a *rhizome;* fronds simple or variously divided; *flowerless;* reproductive organs consisting of *thecæ* or semi-transparent cases appearing on the back or margin of the fronds.

FILITE'LÆ (*filum*, a thread, *tela*, a web). A family of Spiders, remarkable for the long threads of silk which they spread about in the places where they prowl in quest of prey.

FILTRA'TION. The process of *straining* a liquid through a *filter*, or separating it mechanically from the particles which are mixed with it. Filters are usually made of unsized or blotting paper.

FI'MBRIATED (*fimbria*, a fringe). Fringed; having the margin bordered by filiform appendages; a term applied to the thin, elevated, fin-like processes, belonging to many of the *murices*, and sometimes placed round the aperture of cyclostomous land-shells.

FI'ORITE. Pearl sinter; a volcanic production, chiefly silica, in a stalactitic form.

FIRE-BALLS. Bolides, or fiery meteors; luminous bodies, which suddenly appear at a considerable height in the atmosphere, and shoot through the heavens with great velocity, sometimes accompanied with the fall of an aërolite.

FIRE DAMP. A gas evolved in coal mines, consisting almost entirely of light carburetted hydrogen.

FIRE ENGINE. The fire engine is a modification of the forcing pump. It consists of two such pumps, the pistons of which are moved by a lever with equal arms, having a common fulcrum. When one piston is descending, the other is ascending. The machine acts precisely like the forcing pump, only that its power is doubled by having two pistons instead of one.

FIRE, GREEK. An inflammable composition employed in the wars of the middle ages, supposed to consist principally of naphtha mingled with pitch and sulphur.

FISH. The name applied to a class of animals occupying the lowest station of the four great divisions of the section Vertebrata. They are distinguished, with reference to the substance of their skeleton, into the *osseous* and the *cartilaginous* or chondropterygious. See *Ichthyology*.

FISSI'PAROUS (*fissus*, cleft, *pario*, to bring forth). A designation of that mode of propagation, which takes place by *spontaneous division* of the body of the parent into two or more parts, each part, when separated, becoming a distinct individual, as in the monad, vorticella, &c.; or by *artificial division*, as in the hydra, planaria, &c.; and in the propagation of plants by *slips*.

FISSIPE'NNÆ (*fissus*, cleft, *penna*, a wing). A family of *Lepidopterous* insects, commonly called Plumed Moths, and characterized by the division of the membrane of the wings into branches or rays, of which each pair has from two to six.

FISSIRO'STRES (*fissus*, cleft, *rostrum*, a bill). A group of the *Insessores*, or Perching Birds, having a short, broad, horizontally-depressed bill, so formed that the gape of the mouth is extremely wide. It comprises the swallows, goatsuckers, bee-eaters, kingfishers, and todies.

FI'STULOUS (*fistula*, a pipe). Cylindrical and hollow, as the stems of grasses, of umbelliferous plants, &c.

FIXED AIR. A name formerly given by chemists to the air which was extricated from lime, magnesia, and alkalies, now called carbonic acid gas.

FIXED SIGNS OF THE ZODIAC. These are Taurus, Leo, Scorpio, and Aquarius; they are so called because the season is considered to be more settled when the sun passes through these signs, than at any other times of the year.

FIXED STARS. Stars which do not appear to change their relative situations, as distinguished from planets and comets.

FI'XITY. The property by which bodies resist the action of heat, so as not to rise in vapour, as the *fixed*, in contradistinction to the *volatile* oils; or non-metallic elements, which can neither be fused nor volatilized, as carbon, silicon, and boron.

FLABE'LLIFORM (*flabellum*, a fan, *forma*, likeness). Fan-shaped; plaited like the rays of a fan, as descriptive of the leaves of some palms.

FLAGE'LLUM (Lat. *a whip*). An appendage of the legs of the Crustacea, resembling a whip. By the early botanists the term *flagella* was applied to the trailing shoots of the vine; and the word *flagelliform*, or whip-like, is employed to characterize the long, taper, and supple roots of certain plants.

FLAKE-WHITE. Oxide of bismuth, so called from its occurring in the form of small laminæ or flakes. The term is often applied to the purest *white lead*.

FLAME. Gaseous matter heated so highly as to become luminous. The flame of volatile carbonaceous combustibles, as coal gas, consists of three parts —an interior cone of vaporized combustible, an intermediate sphere of partial combustion, and an exterior sphere of complete combustion.

FLAMELESS LAMP. A lamp in which the combustion of inflammable substances is carried on at a temperature below that required for their inflammation. Thus, if a jet of the gaseous hydrocarbons be allowed to escape into the air, and a red-hot coil of platinum be introduced into it, the wire will be maintained at a red heat, and the gas will be consumed invisibly; but if the temperature of the wire be raised to a white heat, the gas will immediately burst into flame.

FLAT. A character in Music, marked ♭, which depresses the note before which it is placed a chromatic semitone. An *accidental flat* is that which, not occurring in the clef, affects only the bar in which it is placed. A *double flat* depresses a note two semitones below its natural state; thus B *double flat* is, in fact, A *natural*. A *flat fifth* is an interval of a fifth depressed by a flat, called by the ancients *semidiapente*.

FLEXIBI'LITY (*flecto*, to bend). That property of bodies by which, on the application of force, they change their form and bend; it is opposed to stiffness on the one hand, and to brittleness on the other.

FLE'XURE (*flecto*, to bend). The bending of a line or surface. The *point of contrary flexure* is that point of a curve at which the curvature passes from convex to concave, or *vice versâ*, with respect to the axis.

FLINT. *Silex*. A mineral, consisting of silicious earth, nearly pure. In Geology, *flint* is a variety of the quartzose rocks, of various colours, with a conchoidal fracture and horny aspect. *Flinty slate*, *silicious schistus*, or *Lydian stone*, is another variety of the same rocks, and, when polished, is used as a touchstone for ascertaining the comparative purity of gold and silver.

FLINTS, LIQUOR OF. A solution of flint or silica in potash, prepared by fusing together hydrate of potash and powdered flint or fine sand.

FLOATA'TION, STABLE. A term applied to that position of a floating body in which it is not capable of being upset by the exertion of a small force, but invariably returns to its former position. This is not the case when its position is *unstable*, as small impulses then induce a change of place, which commonly produces stable equilibrium.

FLOATING CURRENT. A moveable conductor, invented by De la Rive, for illustrating the action of electric currents on each other.

FLOATSTONE. A sub-species of the indivisible quartz of Mohs. It occurs incrusting flint, or in imbedded masses in a secondary limestone at St. Ouen, near Paris.

FLOCCI (*floccus*, a lock of wool). Woolly filaments found mixed with sporules in the interior of some fungaceous plants. The same name is also applied to the external filaments of Byssaceæ.

FLOETZ ROCKS (*flötz*, German, a layer or stratum). A term applied, in Germany, to the secondary strata, because these rocks were supposed to occur most commonly in flat horizontal layers.

FLO'RA (*flos, floris*, a flower). A term expressive of the botanical productions of any particular country.

FLO'RETS. *Flosculi*. The small flowers which compose the capitulum of Compositæ. Those of the circumference are ligulate, or strap-shaped; those within the circumference are tubular; the former are called *florets of the ray*, the latter *florets of the disk*.

FLOS-FERRI. A radiated variety of carbonate of lime, or of calc-spar, often found in veins of spathose *iron*-ore.

FLOWER. In botanical language, the flower is a terminal bud comprising all the organs which contribute to the process of fecundation, as the calyx, the corolla, the stamens, and the pistil; of these, the last two only are indispensable.

FLOWERS (in Chemistry). A term formerly used to denote such bodies as assume a *pulverulent* form by sublimation or crystallization: thus we have *flowers of zinc*, or the oxide; *flowers of benjamin*, or benzoic acid; *flowers of sulphur*, or sublimed sulphur, &c.

FLU'CERINE. The native deutoxide of cerium, occurring near Falun, in Sweden.

FLU'ELLITE. A rare mineral, consisting of hydrofluoric acid and alumina, occurring at Stenna-gwyn, in Cornwall.

FLUENT or FLOWING QUANTITY. This term denotes, in analysis, the variable quantity, considered as increasing or diminishing. The term is now superseded by that of *integral*, and the methods of fluxions and fluents have been laid aside for the differential and integral calculus.

FLUID. A *fluid* is a collection of material particles, which are held together by so slight a degree of cohesion, as to be easily moved among themselves. 1. *Elastic* fluids are those which are capable of being compressed into a smaller bulk, and of recovering their dimensions when the compressing force is removed; of this kind are atmospheric air and all the gases. 2. *Inelastic* fluids are those formerly supposed to be incompressible, and among these were ranged water, mercury, alcohol, and liquids generally. But the term is incorrect: the phenomenon of the transmission of sound through water and other liquids had long ago indicated that they were capable of being compressed.

FLUI'DITY (*fluo*, to flow). The state of bodies when their parts are very readily moveable in all directions with respect to each other. There is a *partial* fluidity, in which the particles are condensed or thickened into a coherent though tremulous mass. Jellies are of this kind, and may be considered as holding a middle place between liquids and solids.

FLUOBO'RIC ACID. *Fluoride of boron.* A gas produced by the decomposition of fluor spar, by means of vitrified boracic acid.

FLUOR SPAR. The technical name for the *fluoride of calcium*, a salt found crystallized in cubes of various colours. A compact variety occurs in Derbyshire, which is cut into ornamental vases.

FLU'ORIDES. Compounds of fluorine with the electro-positive elements, obtained by treating the fluate of mercury or of lead with bodies more positive than these metals.

FLU'ORINE. An elementary body generally found in the mineral kingdom in combination with calcium, or as fluoride of calcium, which constitutes the mineral fluor spar.

FLUOSI'LICIC ACID. *Fluoride of silicon.* A colourless gas, produced by the action of hydrofluoric acid on glass.

FLUX (*fluo*, to flow). A substance used in Chemistry and Metallurgy, to reduce ores or metallic compounds to the metallic state, by promoting their fusion. Alkaline fluxes are generally employed, which render the earthy mixtures fusible by converting them into glass. *Black flux* is a mixture of nitre and bitartrate of potash; *white flux* is a carbonate of potash. Other fluxes consist of argol, charcoal, and some kinds of glass.

FLU'XIONS (*fluxio*, a flowing). In the Newtonian analysis, fluxions are the "velocities of motions." More particularly defined, a fluxion is the magnitude by which any *flowing quantity* would be uniformly increased in a given portion of time, with the generating celerity at any proposed position, or instant, supposing it thence to continue invariable. Hence it appears that the fluxions of quantities are always as the celerities by which the quantities themselves increase in magnitude. The method of fluxions, derived from that of *prime* and *ultimate ratios*, has been entirely superseded by that of the *differential calculus*.

FLY POWDER. An oxide of arsenic, formed by the exposure of native arsenic to the air, and employed, when mixed with sugar and water, for destroying flies.

FLY-WHEEL. A large heavy wheel applied to steam engines and other machines, for the purpose of equalizing the effect of the moving power. If the moving power slackens, the fly-wheel impels the machine forward; if the power tends to impel the machine too fast, the fly-wheel slackens it. Its object is, therefore, to absorb, as it were, the surplus force at one part of the action of the machine, and to give it out when the action of the machine is deficient. At one time it is an impelling, at another a retarding power.

FOCUS. The Latin term for a *hearth* or fire-place; hence it denotes any point in which light, or heat, is concentrated. In Optics, it is the point where several rays are collected, in consequence of refraction or of reflexion. In Geometry and Conic Sections, it is applied to certain points in the ellipse, the parabola, the hyperbola, where the radii from all parts of these curves meet.

1. *Foci of an Ellipse.* Two points in the transverse diameter of an ellipse, equally distant from its ends, and so situate that, if any point be taken in the circumference of the ellipse, and lines drawn from that point to the two foci, the length of these lines, when joined together, will always be the same, at whatever part of the circumference the point may be taken.

2. *Foci of Mirrors.* 1. The focus of a *concave* mirror is that point of the axis through which the reflected rays of light pass; the *principal focus* is the focus of parallel rays. 2. In the *convex* mirror, the focus lies as far behind the reflecting surface as in the concave it lies before it; it is generally called the *virtual focus*, because it is only an imaginary point, and is not formed by the actual union of rays in a focus. Similar terms are employed in speaking of the *foci of lenses*.

3. *Focus, Geometrical and Refracted.* The point in which the rays of light, according to their known laws, ought to be concentrated, when reflected from a concave mirror, or refracted through a lens, is termed the *geometrical focus*; that in which they are actually found, is the *refracted focus*. These foci are separated from each other in proportion to the degree of spherical aberration.

4. *Focal Distance.* In the *concave mirror*, this is the distance between the focus and the vertex of the mirror, and it is always equal to half the radius of that sphere of which the mirror forms a segment. In the *convex lens*, it is the distance of the focus from the surface of the glass, or from the optical centre.

FO'LIATE CURVE (*folium*, a leaf). A curve line of the third order, defined by the equation $x^3+y^3=axy$. It is one of the species of defective hyperbolas, having one asymptote and two infinite branches. Its name is derived from the resemblance of its figure to that of a *leaf*.

FO'LIATED (*folium*, a leaf). Resembling a leaf. The external surface of a shell is said to be foliated, when its varices or spines are divided at their margins into leaf-like segments, as in the rose-bush murex. The substance of a bivalve shell is also said to be foliated, when it consists of thin flat plates overlapping each other.

FO'LIATED COAL (*foliatus*, having the texture of leaves). A sub-species of black coal, occurring in the coal formations, and distinguished by its *lamellar* concretions, splendent lustre, and easy frangibility.

FOLIA'TION (*folium*, a leaf). A term synonymous with *vernation*, denoting the manner in which the young leaves of plants are arranged in the leaf-bud. The terms expressive of the various modes of arrangement of leaves are the same as those employed for the floral envelopes, and will be found under the word *Estivation*.

FO'LIOLE (*foliolum*, a little leaf). A leaflet; a term applied, in Botany, to the small leaves which are borne on the several divisions of what is commonly called a compound leaf.

FO'LLICLE (dim. of *follis*, a pair of bellows). Literally, a little bag, or scrip of leather. The term denotes, in Botany, a one-celled, one-valved, superior fruit, dehiscent along its face, as in pæonia.

Double Follicle. This term is applied by Mirbel to the *conceptaculum* of other writers, and consists of a two-celled, superior fruit, separating into two portions, the seeds of which do not adhere to marginal placentæ, as in the follicle, but separate from their placentæ, and lie loose in each cell, as in asclepias.

FO'MALHAUT. A star of the first magnitude in the southern constellation Piscis Australis.

FORA'MEN (*foro*, to pierce). An opening. A passage observed at the apex of the ovule in plants, and comprising both the exostome and the endostome.

FORAMINI'FERA (*foramen*, an opening, *fero*, to bear). The name of a family of microscopic shells, the chambers of which communicate with each other by a small opening or *foramen*. They are not all cephalopods, as D'Orbigny supposed, who gave them the name.

FORCE. The general designation of any exertion which has a tendency to move a body at rest, or to affect or stop the progress of a body already in motion. This is sometimes termed *active force*, in contradistinction to that which merely resists or *retards* the motion of a body, but is itself, apparently, *inactive*. The degree of resistance to any motion may be measured by the *active force* required to overcome that resistance, and hence writers on Mechanics make use of the terms *resisting forces* and *retarding forces*. The straight line in which any force tends to make a body move, is termed the *line of direction of the force*.

1. *Forces, Composition of.* An expression employed in Mechanics, when two or more forces act on a body in the same direction, or in diametrically opposite directions, or at some angle. In all these cases, the force which represents the combined effects of all the forces is called the *resultant.* 1. In the first case, the resultant is the sum of all the forces, and the line of direction is one and unchanged. 2. In the second case, the body will remain at rest, if the forces are *equal;* but if they are *unequal,* the resultant is the difference of the forces, and the direction that of the greater force. 3. In the third case, the resultant is a *mean* force in an intermediate direction. Thus any number of forces may be resolved into one resulting force, the effect of which is the absolute motion; and any motion may be assumed to be the result of a single force, or of a combination of many. This is termed the *composition and resolution of forces.*

2. *Forces, Parallelogram of.* A term used as explanatory of the third case in the preceding paragraph. If the lines which each of two forces, acting singly, *would* have caused a body to describe in a given time, make any angle whatsoever with each other, the line which the body *will* describe in that time, when both the forces act upon it at the same instant, is the *diagonal of the parallelogram* under the two first-mentioned lines.

3. *Force, Accelerated.* The increased force which a body exerts, in consequence of the acceleration of its motion. By some writers this is termed *accumulated force.* See *Acceleration.*

4. *Forces, External and Internal.* The former are those which act upon masses of matter at sensible distances, as attraction and repulsion. The latter, or molecular forces, are those which act only on the constituent molecules of matter, and at insensible distances, as cohesion.

5. *Force, Centrifugal and Centripetal.* The tendency of the planets to move forward in a straight line, is called the *centrifugal force.* and the attraction of the sun, by which they are drawn downwards, or towards a centre, is called their *centripetal force*; and it is by these two forces that the planets are made to perform their constant revolutions around the sun.

6. *Forces, Polar.* Those forces which are conceived to act with equal intensity in opposite directions at the extremities of the axes of molecules, or of masses of matter

FO'RCER. A solid piston, employed in the construction of pumps for producing a constant stream, or raising water to a greater height than it can be raised by atmospheric pressure.

FORE-STAFF. An instrument used at sea for taking the altitudes of the celestial bodies. It is now superseded by more perfect instruments.

FOREST MARBLE. A portion of the series of the Lower Oolite Formation, consisting of a coarse laminated shelly oolite, interposed between beds of clay, sand, and grit.

FORFICU'LIDÆ (*forficula,* a forked claw). A family of orthopterous insects, named from the genus *forficula,* and constituting, according to some writers, the order Dermaptera. They comprise the various species of earwig.

FORM. The mode in which an object is presented to our mind or senses: in the former case it belongs to the *categories;* in the latter to *figure.*

FORMA'TION. A group of alluvial deposits, sedimentary strata, or igneous rocks, referred to a common origin or period. In geological treatises, one or more simple minerals constitute a *rock;* one or several rocks, united by certain common characters, constitute a *formation,* or connected series; and several formations constitute a *system* of rocks.

FO'RMIC ACID (*formica,* an ant). A peculiar acid extracted from red ants, and procured artificially from all vegetable substances by oxidation with acids. Its salts are called *formiates.*

FORMI'CIDÆ (*formica,* an ant). The Ant tribe; a family of *Hymenopterous* insects, distinguished by their subterranean habits, and the existence among them of *neuters,* which perform the labours of the family.

FORMULA (dim. of *forma,* a form). A short general form or rule for the performance of any operation. In Algebra, the expression of a general rule for the solution of a problem.

FORMULÆ, CHEMICAL. A simple mode of exhibiting the composition of chemical combinations by representing the substances by the initial letters of their Latin names, and adding figures or lines to indicate the number of equivalents. Thus K denotes one equivalent of potassium; O^5, five equivalents of oxygen; $\mathrm{N}\!\!\!\!-$ or $\underline{\mathrm{N}}$, two equivalents of nitrogen. For every equivalent of oxygen a *dot,* for every equivalent of sulphur, a *comma* is placed over the symbol; thus $\ddot{C}$ represents carbonic acid; $\overset{,}{K}$, sulphuret of potassium; $\dot{K}\,\overset{\cdot\cdot\cdot\cdot\cdot}{\not{N}}$. nitrate of potassa.

FO'RMYL. A hypothetical radical of a series of compounds, one of which is *formic acid.*

FORNAX CHEMICA. The Chemist's Furnace; a modern southern constellation, consisting of fourteen stars, and situated immediately below Cetus.

FORNIX. Literally, an arch; a term applied to an assemblage of small plates, or lamellæ, which overarch the orifice of the tube of the flower in certain plants, as cynoglossum.

FO'RSTERITE. A crystallized mineral containing silica and magnesia, found at Vesuvius, accompanied by pleonaste and pyroxene, and named from Mr. Forster.

FO'SSIL (*fossilis,* dug out of the earth). Any thing dug out of the earth. The term is now restricted to "organic remains," or the petrified remains of animal and vegetable substances found imbedded in the strata of the earth.

FOSSIL COPAL. *Highgate resin.* A mineral of a resinous odour, found in the bed of blue clay at Highgate, near London, and at Wocklow in Moravia.

FOSSILI'FEROUS (*fossilis,* dug out of the earth, *fero,* to bear). A term applied to a formation or rock containing organic remains, or fossils, while those rocks in which no such relics are found are called *non-fossiliferous.*

FOSSO'RES (*fossor,* a digger). Diggers; a general term for a group of aculeate hymenopterous insects, commonly known as *sand* and *wood wasps,* which dig cells in the earth or in wood, for the deposition of their eggs and stores.

FOUNDING. The mechanical art which comprises all the operations of reducing ores, and of smelting and casting metals.

FOURTH. One of the harmonical intervals of music, containing four sounds or terms between its extremes, and three intervals; or as being the fourth in order from the fundamental sound in the natural or diatonic scale. The *diminished fourth* consists of a whole tone and two semitones; the *perfect fourth,* of two whole tones and a semitone; the *superfluous fourth,* extreme sharp, or tritonus, of three whole tones.

FOUSEL OIL. *Hydrate of oxide of amyl.* Oil of grain-spirits or potatoes; an oil produced in the fermentation of unmalted grain and potatoes.

FOVI'LLA. A viscous liquor contained in the pollen-vesicle of plants.

FRACTION (*fractio,* a breaking). An arithmetical quantity which represents a part or parts of an integer, or whole number. A *vulgar fraction* is expressed by means of two numbers placed one over the other, with a line between them; the lower of these is the *denominator,* and shows into how many equal parts the integer is divided; the upper is the *numerator,* and shows how many of these parts are taken to form the fraction, as $\frac{3}{4}$.

1. A *proper fraction* is one whose numerator is *less* than the denominator, and which is itself therefore *less* than the whole in question, as $\frac{3}{8}$. An *improper fraction* is one whose numerator is *equal* to or *greater* than the denominator, and which is itself therefore *equal* to or *greater* than the whole in question, as $\frac{8}{8}$, $\frac{11}{7}$.

2. A *mixed number* is one formed of a whole number and a fraction, as $2\frac{2}{3}$. A *compound fraction* is a fraction of a fraction, as $\frac{3}{4}$ of $\frac{2}{3}$. A *complex fraction* is one in which either the numerator or denominator, or both, are fractions, as—

$$\frac{3\frac{1}{2}}{2},\quad \frac{2}{4\frac{2}{3}},\quad \frac{1\frac{1}{2}}{3\frac{3}{4}},\quad \frac{\frac{3}{4}\text{ of }3}{2\frac{1}{2}}.$$

3. A *continued fraction* is one whose denominator is continued by being itself a *mixed number,* and the denominator of the fractional part again continued as before, and so on; as—

$$\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4}}},\quad 7+\cfrac{5}{3+\cfrac{4}{9+\text{\&c.}}}\quad \cfrac{1}{p+\cfrac{1}{q+\cfrac{1}{r+\text{\&c.}}}}$$

4. A *vanishing fraction* is one in which a supposition is made which destroys both numerator and denominator at the same time; thus,

$$\frac{x^2-1}{x-1}$$

is a fraction which will assume the form of $\frac{0}{0}$, when $x = 1$.

FRACTURE (*fractura,* a breaking). A term employed in geology to designate the appearance of a fresh surface of a rock, when exposed by the stroke of a hammer or any other forcible separation of its parts. It may be *even,* or form a plane of greater or less extent; *uneven,* or formed of variously inclined planes of small extent; *conchoidal,* when one of the separated surfaces is concave, the other convex; *splintery,* when the surface presents the appearance of thin-edged scales; *hackley,* when covered with very sharp protruding points.

FRA'GMENTARY ROCKS. Rocks formed of *fragments* of other rocks, generally of sufficient size to admit of being distinguished into different kinds. When the fragments are very small, they form *sandstones* and *tufas;* when large and rounded, they constitute *conglomerates;* when large and angular, *brecciæ.* The fragments are commonly cemented together by an intervening substance.

FRANGIBI'LITY. In Geology, the degree of facility with which a rock yields to the hammer.

FRA'NKLINITE. A mineral resembling oxidulous iron, occurring in New Jersey, together with the red oxide of zinc.

FRAU'NHOFER'S SPECTRUM. Fraunhofer found that, in a perfect solar spectrum, the coloured spaces are not continuous, but are interrupted by dark lines parallel to the slant edge of the prism. These lines, which are called Fraunhofer's, are more than 500 in number, and were employed by the discoverer for accurately measuring the refraction, the breadths of the individual colours, and the intensity of the light of different luminous bodies.

FREE CHARGE. A term applied, in experiments with the Leyden jar, or battery, to that portion of the induction which is directed through the air to surrounding conductors.

FREEZING MIXTURES. The rapid absorption of heat which bodies exhibit in passing from the solid to the fluid state, explains the operation of *freezing mixtures.* If nitre be dissolved in water, the temperature of the liquid falls above 16 degrees. If *snow* and a third of its weight of common salt be mixed together, they become liquid, and the temperature of the mixture may fall to 0°. These phenomena depend upon the affinity which exists between these salts and water; in order to satisfy this affinity, the bodies melt, and in so doing absorb heat, which becomes latent in them, from surrounding bodies. By this means, considerable degrees of cold may be produced; the degree of cold depends on the quantity of heat which passes from a free to a latent state; and this, again, depends upon the quantity of the substance liquefied, and the rapidity of the liquefaction.

FREEZING POINT. A fixed point in the scale of the thermometer, at which snow or ice melts. The length of the degrees depends on the system of graduation adopted; in Fahrenheit's thermometer, the freezing point is marked 32°. The space between the freezing and the boiling point is the *fundamental distance,* or length of the scale.

FRENCH WHITE. The common designation of finely pulverized talc.

FRIABI'LITY (*frio,* to crumble). The property by which a substance is capable of being crumbled and reduced to powder.

FRICTION (*frico,* to rub). The act of rubbing the surfaces of bodies upon one another. In Mechanics, it is a hinderance of motion, and is termed a *retarding force.* Friction is said to be *sliding,* when the parts of one surface move parallel with the other, as when an axle moves in the nave of a wheel; and *rolling,* when a round body turns about the surface of some other body, so that fresh points of both the surfaces are continually brought into contact with each other.

Measure of Friction. The force required to abrade the elevated parts of the moving surfaces, or to raise them from the depressions in which they had become lodged. This is usually found by trying what part of the weight of the moving body must be exerted to maintain its equilibrium, or to overcome the resistance arising from this source. The fraction expressing this ratio is called the *co-efficient of the friction.*

FRICTION WHEELS. A contrivance for diminishing attrition by the substitution of a *rolling* motion. The extremities of an axle, instead of resting in a cylindrical socket, are made to rest on the circumference of two revolving wheels, to which the friction is transferred, and consequently diminished in the ratio of the radius of the friction wheels to the radius of the axle.

FRIESLAND GREEN. *Brunswick green.* Ammoniaco-muriate of copper.

FRIGID ZONES. The two divisions, or *belts,* of the surface of the earth, which lie between the Polar Circles and the Poles—one in each hemisphere. They are so called from their excessive cold, arising from the total absence of the sun from them during a great part of the year.

FRINGI'LLIDÆ (*fringilla*, a finch). The Finches; a family of the *Insessores*, or Perching birds, readily known by the strength and shortness of their conical bills. See *Conirostres.*

FRINGING REEF. A Coral production, differing from the Barrier Reef in having a comparatively small depth of water on the outer side, and a narrower and shallower lagoon channel between it and the main land.

FRITH or FIRTH (*fretum*, a narrow sea). A narrow and deep inlet of the sea, especially in a rocky and elevated coast. Such an inlet is commonly called a *sound.*

FRITT. The mass produced by the materials of glass, on calcination.

FROND (*frons*, a branch). A term applied to the foliaceous part of Ferns and other Cryptogamic plants, from their partaking at once of the nature of a leaf and a branch.

FRONT (*frons, frontis*, the forehead). That part of a shell near which the head of the animal protrudes. The term is also applied to the under surface of spiral shells, where the aperture is placed, in contra-distinction to the back.

FRO'NTLET (*frons*, the front). The margin of the head behind the bill of birds, generally covered with stiff bristles.

FROST. The water or vapour of the atmosphere congealed by cold. *Hoar-frost* is frozen dew, and indicates an insensible transition from dew, in consequence of reduced temperature. *Frost-smoke* consists of frozen particles of water floating in the atmosphere in the form of crystallized spiculæ; when these occur in large masses, they become agglutinated together into *flakes*, and fall to the earth in the form of *snow.*

FRUIT. In botanical language, the fruit is the ovary or pistil arrived at maturity; the term is also extended to whatever parts are combined with the ovary when ripe. An *inferior fruit* is that in which the pericarp adheres to the calyx; a *superior fruit* is that in which no such adhesion takes place: the apple is an inferior, the orange a superior fruit.

FRUSTUM. Literally, a fragment. A portion cut off from any solid figure. The *frustum of a cone* is any part cut off from a cone which does not contain the vertex; otherwise, the part cut off would be itself a cone. The *frustum* differs from *fragment*, which is a piece broken, and from *segment*, which is a piece cut off.

FRUTEX. A shrub; a plant whose branches are perennial, proceeding directly from the surface of the earth without any supporting trunk. When very small, the plant is termed *fruticulus*, or little shrub.

FUCI'VOROUS (*fucus*, sea-weed, *voro*, to eat). A term applied to animals which subsist upon sea-weed.

FUGUE. A musical composition, in which the subject, or brief air, passes successively and alternately from one part to another, according to certain rules of harmony and modulation.

FULCRUM. The prop, or support on which a lever is sustained, and about which it moves. In raising a stone, the body on which the lever rests, is the fulcrum.

FULGO'RIDÆ (*fulgora*, the lantern-fly). A family of the trimerous *Homoptera*, characterized by the large development of their forehead, in which the luminosity of the lantern-fly is said to exist.

FULGURA'TION (*fulgur*, lightning). A term applied, in assaying, to the sudden brightening of the fused globule of gold or silver when the last film of oxide of lead or copper leaves its surface.

FU'LGURITE (*fulgur*, lightning). A term applied to a bore or tube produced by the passage of lightning into a sandy soil, into which it sometimes penetrates to a depth of twenty feet, fusing the gravel which it penetrates.

FULI'GINOUS (*fuligo*, soot or smoke). A term applied to vapours which possess the property of smoke.

FULIGULI'NÆ. The Sea ducks; a sub-family of the *Anatidæ*, named from the genus *fuligula:* they frequent the sea principally, but many of them are also found in fresh-water lakes and deep rivers.

FULLER'S EARTH. A variety of clay, of an unctuous quality, forming a part of the Lower Oolite Formation. It is named from its being employed by fullers to remove the grease from cloth before the soap is applied.

FU'LMINATE (*fulmen*, a thunderbolt). A compound of the fulminic acid with a base, detonating by heat or friction.

FU'LMINATING POWDER (*fulmen*, a thunder-bolt). A general term applied to powders which fulminate on the application of heat or friction. Of this kind are the *fulminating gold*, prepared by keeping recently precipitated peroxide of gold in strong ammonia for a day; *fulmi-*

nating mercury, employed for percussion caps, and obtained by dissolving mercury in nitric acid, and pouring the solution into alcohol; *fulminating silver*, prepared by leaving oxide of silver for a day in a strong solution of ammonia.

FULMINA'TION (*fulmen*, a thunderbolt). The explosion which takes place in chemical bodies by heat or friction.

FULMI'NIC ACID (*fulmen*, a thunderbolt). A compound of cyanogen, corresponding in its ultimate composition with *cyanic acid*, and exploding when heated, rubbed, or struck.

FUMA'RIC ACID. A monobasic acid, existing in *fumaria* or fumitory, and produced artificially by heating malic acid.

FUMING LIQUOR (*fumus*, smoke). A chemical mixture, which emits fumes or vapour on exposure to the air. *Boyle's fuming liquor* is the protosulphuret of ammonium; *Cadet's* is procured by distilling acetate of potash and arsenious acid; *Libavius's* is the anhydrous bichloride of tin.

FUNCTION (*fungor*, to discharge an office). The office of an organ in the animal or vegetable economy, as of the heart in circulation, of the leaf in respiration. *Animal functions* are those which relate to the external world, as the senses, voluntary motions, &c. *Vital functions* are those immediately necessary to life, as those of the heart, the brain, the lungs, which have been termed the *tripod* of life.

FUNCTION (in Analysis). A term applied to an algebraical expression in which a certain letter or quantity is compounded with other letters or quantities: the expression is then said to be a *function* of that letter or quantity; thus $a+x$ and a^2+x^2 are, both, functions of x; the circumference of a circle is the function of the radius.

Functions, calculus of. That branch of analysis which investigates the *form* of a function, and not its value in any particular case, nor the conditions under which it may have a particular value. Thus, the calculus of functions may be considered as similarly related to algebra, as algebra is to common arithmetic.

FUNDAMENTAL BASE. The root, or lowest note of a musical chord, found by inverting its notes so as to set them in thirds above this root.

FUNGACEÆ. The mushroom tribe of Cellular or Acotyledonous plants. Plants consisting of a congeries of cellules, chiefly growing upon decayed substances. *Sporules* lying either loose among the tissue, or enclosed in membranous cases called sporidia.

FU'NGATES. The saline compounds of a peculiar acid extracted from mushrooms.

FUNGIC ACID. An acid procured from several species of *fungus*, by expressing their juice, boiling it, forming an extract, and treating it with alcohol.

FUNGIN. A whitish substance forming the base of fungi.

FUNI'CULAR MACHINE (*funiculus*, a little rope). A mechanical contrivance by which bodies are supported by means of force applied to an assemblage of ropes, as in bracing the sails of ships.

FUNI'CULUS (dim. of *funis*, a cord). The little cord, by which the ovule of plants is attached to the placenta, of which, indeed, it is a prolongation.

FURNACE. A fire-place used for the purposes of fusion, distillation, sublimation, and the oxidation and deoxidation, or reduction of metals. It is termed *evaporatory*, when employed to reduce substances into vapour by heat; *reverberatory*, when so constructed as to prevent the flame from rising; and *forge*, when the current of air is determined by bellows.

FUSCIN (*fuscus*, tawny). A brownish matter obtained from empyreumatic animal oil.

FU'SCITE (*fuscus*, tawny). An opaque greyish or greenish-black mineral, found in Norway, in rolled masses of granular quartz.

FUSELÖL. An oily liquor obtained from alcohol, also termed oil of grain, and, hypothetically, hydrate of amyl.

FUSIBI'LITY. The property by which solid bodies are capable of assuming the fluid state on the application of heat.

FU'SIBLE METAL. An alloy of eight parts of bismuth, five of lead, and three of tin. This compound, sometimes called Newton's, from the name of its discoverer, melts at the heat of boiling water, and may be fused over a candle in a piece of stiff paper, without burning the paper. *Rose's fusible alloy* is a similar compound.

FU'SIFORM (*fusus*, a spindle, *forma*, likeness). Spindle-shaped; thickest in the middle and tapering to the extremities, as the cells composing woody fibre, the fleshy part of the long radish, &c.

FU'SINÆ. Spindle-shells; a subfamily of the *Turbinellidæ*, or Turnip-shells, named from the typical genus *fusus*, and characterized by the remarkable length, generally equal, of the canal and of the spire.

FUSION (*fusus*, melted, from *fundo*, to pour out). The state of melting. Substances which admit of being fused are termed *fusible*, but those which resist the action of fire are termed *refractory*. Fusion differs from liquefaction in being applied to metals and other substances which melt at a high temperature.

1. *Aqueous Fusion.* The solution of salts which contain water of crystallization, on exposure to heat.

2. *Dry Fusion.* The liquefaction produced by heat after the water of crystallization has been expelled.

3. *Igneous Fusion.* The melting of anhydrous salts by heat without undergoing any decomposition.

G

GA'BBRO. The Italian name for a rock consisting essentially of felspar and diallage, called by the French geologists *euphotide*.

GA'DIDÆ (*gadus*, the cod). The Cod tribe; a family of malacopterygious, or soft-spined, fishes, distinguished by the softness of all their fins, and by the insertion of their pointed ventrals under the throat. They comprise the cod, the ling, the haddock, the whiting, &c.

GA'DOLINITE. A rare mineral found by Gadolin in Sweden, containing yttria, oxide of cerium, &c. When heated, it appears to burn, emits light, and becomes yellow, but undergoes no change in weight.

GAGE or GAUGE. A term derived from the Anglo-Saxon, and denoting, in Physics, any apparatus for ascertaining dimension. The *gage of the air-pump* is a barometer, connected with the machine, for the purpose of determining the pressure of the air within the receiver, and, consequently, the degree to which the air has been rarified.

GA'HNITE. *Automalite.* A native aluminate of zinc, in which the alumina plays the part of an acid. It is named from its discoverer, Gahn. A similar combination occurs in *spinel*, which is an aluminate of magnesia.

GALA'CTIC ACID (γάλα, milk). *Lactic acid.* The acid of milk, supposed to be merely animalized acetic acid. *Galactin* is an ingredient in the sap of the Galactodendron utile, or Cow-tree of South America.

GALATHE'IDÆ. A group of crustaceous animals, named from the genus *Galathea*, and constituting, according to Milne Edwards, a transition from the anomourous to the macrourous crustacea, more particularly approaching the *porcellanæ*.

GA'LAXY (γαλαξίας κύκλος, circle of milkiness). The Milky Way; a broad line of light passing entirely round the heavens, and named from its milky whiteness. Herschel supposes the sidereal universe to be divided into clusters or strata of stars, and the "milky way" to be that particular cluster or stratum in which our sun is placed. See *Nebula.*

GA'LBULUS. The Latin term for the fruit of the cypress, and employed by Gœrtner as synonymous with *strobile*, from which it differs only in being round, and having the heads of the carpels much enlarged. The fruit of the Juniper is a galbulus, with fleshy coalescent carpels. Desvaux calls it *arcesthide.*

GA'LEA. The Latin term for a *helmet*, and hence applied, in botany, to the upper arched lip of the corolla of several labiate plants, as in Lamium album.

GALE'NA (γαλέω, to shine). Lead-glance; the native sulphuret of lead.

GA'LIPOT. A white resin derived from the pinus maritima, consisting almost entirely of a colourless, crystallizable resin, named *pimaric acid.*

GA'LLIC ACID. An acid obtained from gall-nuts, but principally by decomposition of tannic acid. By the application of a brisk heat to gallic acid, the *pyrogallic acid* is obtained as a crystalline sublimate; and, on applying heat to the same acid by means of an oil bath, the *metagallic* or *melangalic acid* of Berzelius remains as a fixed residue in the retort.

GALLI'COLÆ. Gall-inhabiters; a family of hymenopterous insects, of the section pupivora, which deposit their ova in the leaf-buds of several species of oak; the buds undergo a morbid action, enlarge into a globular form, constituting a nidus for the larva of the insects, and eventually become the *galls* of commerce.

GALLI'NÆ (*gallus*, a cock). Gallinaceous birds, so named from their affinity to the common cock, and constituting the fifth order of the class *Aves*.

GALL-INSECTS. *Coccidæ*. A family of homopterous insects, the females of which are apterous, and assume, at the period of ovi-position, a globular form analogous to the galls produced by the *Gallicolæ*.

GALLS. Protuberances found on certain plants, occasioned by the puncture of an insect. They differ in consistency, from the hard *nut-gall*, to the soft and spongy *berry* or *apple-gall*. The Aleppo galls are extensively used in dyeing and in the manufacture of ink. See *Gallicolæ*.

GALT. A provincial name applied in the east of England to a series of beds of chalk marl, the geological position of which is between the upper and the lower Greensand.

GALVANISM. A form of electricity named after *Galvani*, and usually elicited by the mutual action of various metals and chemical agents upon each other. The additional discoveries of Volta led to the term *Voltaism*, or *Voltaic Electricity;* and its effects on the muscles of animals newly killed, suggested the term *Animal Electricity*.

1. *Galvanic Circle.* If, between two plates of different metals, a fluid be interposed capable of exciting a chemical effect on the one plate, while it has little or no influence on the other; and if a communication be then formed between the plates at some point, by means of a wire or other conducting substance, a continued current of electricity will pass along the conductor from one plate to the other, so long as the chemical action is excited. This constitutes a simple *galvanic circle*.

2. *Galvanic Pile.* This arrangement consists of a number of pairs of plates, similar to those above described, placed alternately with an acting fluid intervening between each pair, and having the two ends of the series connected by a wire. The effect is thus multiplied by each pair of plates. The end of the pile which gives out the electric fluid is called the *positive pole*, while the other end in which the wire terminates, and which receives the electric matter, is called the *negative pole* of the pile.

3. *Galvanic Battery*, or *Trough.* An apparatus for accumulating galvanism, consisting of plates of zinc and copper fastened together, and cemented into a wooden or earthenware trough so as to form a number of cells; the trough is then filled with diluted acid.

4. *Galvano-meter* (μέτρον, a measure). An instrument which indicates the feeblest polarization of the magnetic needle, or slightest current in the connecting wire of a voltaic circle.

5. *Galvano-scope* (σκοπέω, to examine). An instrument by means of which the existence and direction of an electric current may be detected. A magnetic needle is a galvanoscope.

6. *Galvano-magnetic induction machine.* A machine principally used for medical purposes, and consisting of an induction spiral connected with a hydro-electric battery, which is fitted up with an apparatus for establishing and breaking contact with great rapidity.

GA'MMUT. An old term in Music, now applied to the diatonic scale, and also called the *harmonical hand*, in consequence of Guido having arranged the musical notes upon the figure of a hand. The term gammut, or *gamm'ut*, was derived from the Greek letter γάμμα, applied by Guido to a note which he added below the "supernumerary" note, with the addition of *ut*, which is the same as *do* in the syllabic scale.

GAMOPE'TALOUS (γαμέω, to marry, πέταλον, a petal). A term applied, in Botany, to a corolla consisting of *cohering petals*, in order to avoid the inaccuracy of the word *mono-petalous*.

Gamo-sepalous. A corresponding term, denoting a calyx formed of *cohering sepals*, and therefore preferable to the more common term *mono-sepalous*.

GA'NGLIONE'URA (γάγγλιον, a nerve-knot, νεῦρον, a nerve). A term applied by Rudolphi to the Articulate and Molluscous divisions of the Animal Kingdom, which are characterized by a ganglionic disposition of the nervous system. In the former class, the ganglia are arranged symmetrically along the middle line of the body, and communicate by a double chord; these are termed *homogangliata*. In the latter class, the ganglia are dispersed in an unsymmetrical manner, apart from one another and from the middle plane; these are called *heterogangliata*.

GA'NGUE. A term applied to the stones found in the cavities which form the veins of metals, constituting the matrix of the ore.

GA'NOID FISHES (γάνος, splendour, εἶδος, likeness). A group of fossil fishes, found in the old red sandstone, and other rocks of that period, and named from the brilliant lustre of their scales, which are generally coated with polished enamel. See *Placoid Fishes.*

GAPING. A term applied to a bivalve shell, when any parts of the margins do not meet each other.

GARNET. A simple mineral, generally of a deep red colour, crystallized; occurring most frequently in mica slate, but also in granite and other igneous rocks. Common garnet is less hard, and less transparent than Precious Garnet, which is often perfectly diaphanous. Resinous garnet is another name for the mineral *colophonite.*

GARNET-BLENDE. *Zinc-blende.* A sulphuret of zinc; a massive mineral of adamantine lustre, and often black.

GAS. An old Teutonic word, signifying air or spirit; now applied to permanent aeriform fluids for the purpose of distinguishing them from common air, which is a mixture of two kinds of gas. *Gases* are distinguished from *liquids* by the name of *elastic fluids;* and from *vapours,* by their retaining their elasticity in all temperatures.

GASO'METER. A gas-holder; a metallic apparatus for containing a large quantity of any gas which is insoluble in water.

GASTERO'PODA (γαστὴρ, the stomach, πόδες, feet). The third class of the Mollusca, including the slugs and shell-snails, and distinguished by the structure and position of their locomotive apparatus, which consists of a muscular disc attached to the ventral surface of the body, serving either as an instrument for crawling, or, in rarer instances, compressed into a muscular membrane for swimming. They may be divided into three orders by the forms of their respiratory organs and of their external covering:—

1. *Nudibranchia,* or those which breathe by branchiæ unprotected by an external or internal shell.

2. *Tectibranchia,* or those which have the branchiæ protected by an external or internal calcareous covering.

3. *Pulmonata,* or those which respire by means of a pulmonary sac.

GAY-LUSSITE. A crystalline mineral found abundantly in South America, and named from the French chemist Gay Lussac, who ascertained it to be a double carbonate of soda and lime, with 5 equivalents of water.

GECKO'TIDÆ. The Gecko tribe; a natural family of Saurians, named from the genus *gecko,* and characterized by the peculiar structure of the foot, the sole of which is converted into a sucker, enabling the animal to crawl up walls and along ceilings, after the manner of the flies on which they feed.

GE'HLENITE. A mineral, allied to Vesuvian, found together with calcareous spar in the valley of Fassa in the Tyrol.

GE'INE (γήϊνος, earthy). *Geic acid.* Another name for *humus,* or vegetable mould, produced by the decomposition of vegetable matters.

GE'LATINE (*gelu,* frost). An animal or vegetable substance, constituting the principle of jelly, and distinguished from albumen by its not becoming consistent by heat. The purest variety of gelatine is *isinglass;* the common gelatine of commerce is *glue;* and the hydrate of gelatine is *jelly.*

GE'LATINES. The term applied by Mr. Kirby to the *Acalephæ* of Cuvier, or the *Radiaires molasses* of Lamarck, from the gelatinous consistency of their bodies.

GE'MINI. The third of the zodiacal constellations, consisting of eighty-five stars, the principal of which are Castor and Pollux. It denotes the third month of Autumn, from the 20th of November to the 20th of December. In the Egyptian zodiac this sign is represented by a young man and a girl. In this month seeds germinate. The Greek appellation for this sign, δίδυμοι, is vague.

GEMITRI'CES (*gemo,* to moan or coo). Cooers; an order of Birds, comprising, according to Macgillivray, the single family of *Columbinæ,* or Pigeons, and named from their peculiar cooing sound.

GE'MMA. A leaf-bud, or the rudiment of a young branch, consisting of scales surrounding a *growing point,* which is in direct communication with the woody and cellular tissue of the stem. This term, as applied to zoophytes, denotes a young animal not enclosed in an envelope or egg.

GEMMA, α CORONA BOREALIS. *Alphacea.* A star of the second magnitude in the Northern Crown.

GEMMI'PAROUS (*gemma,* a bud,

pario, to bring forth). A designation of that mode of propagation, which takes place by the growth of the young, as of a bud, from the parent, as in many of the infusoria.

GE'MMULE (dim. of *gemma*, a bud). A term synonymous with *plumule*, and denoting the growing point of the embryo in plants. It is also applied to the embryo of the radiated animals at that stage of their existence when they resemble ciliated monads.

GENDER. In Grammar, that accident of a noun which points out the sex or the absence of sex.

GENERALIZA'TION. The act of comprehending under a common name several objects agreeing in some point which we abstract from each of them, and which that common name serves to indicate. Each of these names is called, in Logic, a *common* term, from its belonging to them *all alike;* or a *predicable*, because it may be predicated affirmatively of them, or of any one of them. See *Abstraction*.

GENERATING FUNCTION. A term applied by Laplace to any function of x, considered with reference to the coefficients of its expansion in powers of x. It is employed in solving equations of differences, &c.

GENERA'TION. In Geometry a line is said to be *generated* by the motion of a point, a surface by the motion of a line, a solid by that of a surface. Thus, a sphere is generated by the revolution of a semicircle about its diameter; a circle, by the revolution of its radius about one of its extremities. The figure thus generated is termed the *generant*. From this mode of considering quantity as generated by motion, arose the terms *fluxion* and *fluent* in infinitesimal analysis.

GENI'CULATE (*geniculum*, a little knee or joint). Knee-jointed; bent abruptly in the middle, as the stems of many grasses, the filament of certain plants, &c. The term *geniculum* is applied to the *node*, or point of the stem from which the leaves are developed.

GENITIVE CASE (*gigno*, to beget). In Grammar, the *getting* case, known by the sign *of*, and answering to the question *whose*, or *whereof?* It denotes the relation of property, and indicates the subject to which a thing belongs.

GENTIANA'CEÆ. The Gentian tribe of Dicotyledonous plants. Herbaceous plants with *leaves* opposite; *flowers* terminal, axillary; *stamens* alternate with the segments of the corolla; *ovarium* single, superior, 1 or 2-celled; *fruit* a many-seeded berry.

GE'NUS. In Logic, a predicable which is considered as the material part of the *species* of which it is affirmed. A *subaltern genus* is that which is capable of being a *species* in respect of a higher genus. A genus which is not considered as a *species* of any thing, is called *summum* (the highest) *genus*. When it is said of a magnet, that it is "a kind of *iron-ore*," this is called its *proximum genus*, because it is the closest (or lowest) genus which is predicated of it: "mineral" is its more *remote* genus.—*Whately*.

In Natural History, a *genus* denotes a class of animals or plants which possess some common property. The other *permanent* differences between the individuals of the same genus constitute a *species;* and the *accidental* differences found among the species are termed *varieties*.

GEOCENTRIC (γῆ, earth, κέντρον, the centre). Having the same centre as the earth, or having the earth for its centre. Thus the moon's orbit is geocentric; but the orbits of the other planets, and of the earth itself, are *heliocentric*, having the sun as their centre of motion. The *geocentric place* of a planet is the place in which it would appear to an eye in the centre of the earth. The *geocentric latitude* of a planet is its latitude as seen from the earth; or it is the inclination of a line connecting the planet and the earth to the plane of the ecliptic. The *geocentric longitude of a planet* is the distance, measured on the ecliptic, in the order of the signs, between the *geocentric place* and the first point of Aries.

GEOCO'RISA (γῆ, earth, κόρις, a bug). The Land-bugs; a section of *Heteropterous* insects, including several families which strongly resemble the Cimicidæ, or common bugs. See *Hydrocorisa*.

GEO'DES (γεώδης, earthy). A variety of aëtites, or eagle-stone, the cavity of which, instead of containing a nodule, contains only loose earth, and is generally lined with crystals.

GEODE'SY (γεωδαισία, a dividing of earth). A term literally signifying a *division of the earth*, and so far synonymous with geometry, or land-measuring. In a more general sense, however, it signifies that branch of practical geometry which comprehends all the operations, geometrical and trigonometrical, required for determining the general figure of the earth, the figures and areas of large portions of the earth's surface, and the variations of the intensity of gravity in different regions, by means of direct observation and measurement.

GEO'GRAPHY (γῆ, the earth, γράφω, to describe). The science which teaches the knowledge of the earth. This is the strict etymological meaning of the term, which is thus distinguished from *hydrography*, or the description of water, or seas, which constitute the greater portion of the terraqueous globe. It differs from *cosmography*, as a part differs from the whole; from *chorography* and *topography*, as a whole differs from a part.

1. *Physical Geography*, though, strictly speaking, it denotes merely a description of the principal features of the earth's surface, usually includes the subjects of climate and of temperature, the effect of these agents on the condition of the human race, and, generally, an account of the animals and productions of the globe. Hence it comprises the various questions of Hydrography, Meteorology, and Climate.

2. *Mathematical Geography* is that branch of the general science which is derived from the application of mathematical truths to the figure and dimensions of the earth, to its relations with the celestial bodies, to the relative positions and distances of places on its surface, and to their representations by globes or maps.

3. *Political Geography* relates to history and statistics, and comprises all the moral and social conditions of nations, as inhabitants of the globe.

GEO'LOGY (γῆ, the earth, λόγος, an account). *Geognosy*. A description of the structure of the earth, and of the theories entertained respecting its formation. A short tabular view of the *successive geological periods* is here given, with particular reference to the forms of organic life most strikingly exhibited in each:—

I. The First or Ancient Epoch.

1. The period antecedent to the introduction of life. The deposit of non-fossiliferous rocks.

2. The period of invertebrated animals, as the most highly organized inhabitants of the sea. *The Silurian rocks.*

3. The introduction of fishes, the characteristic animals of the second fossiliferous period. *The Devonian*, or Old Red Sandstone system of Formations.

4. The period marked by the presence of vegetables and the first introduction of reptilian animals. *The Permian and Carboniferous Systems.*

II. The Middle Epoch.

5. The periods of the frog-like, bird-like, and marine reptiles. The formation of the New Red Sandstone, or *Triassic Series.* Animals characteristic of the *Lias Formation.*

6. The periods of the gigantic land reptiles, the flying reptiles, the gigantic crocodilians, and the first introduction of mammalian animals. *Wealden and Oolitic Formations.*

7. The periods of the *Chalk* and *Greensand*, during the deposit of which there was probably a deep sea, covering a large proportion of the existing land. *Cretaceous Period.*

III. The Modern Epoch.

8. The period of the pachydermatous animals of the Paris basin, and of the sub-tropical (?) fruits and animals of the London and Hampshire basins. *Older Tertiary System.*

9. The period of various large animals of the Middle Rhine valley, succeeded by that of the mastodon and elephants in North America, England, Northern Europe, and India. *Middle Tertiary System.*

10. The period of the caverns and gravel; with Carnivora, the Megaceros and other gigantic ruminating animals, and the elephants of Europe; and of various gigantic animals in Asia, America, Australia, and New Zealand. *Newer Tertiary System.*

GEO'METRY (γεωμετρία, land-measuring). The etymological meaning of this term seems to imply that the *measurement of land* was the most important, perhaps the only, use to which this science was at first applied. It now embraces the measurement of the earth and of the heavens; and it forms, with Arithmetic, the basis of all accurate conclusions in the mixed sciences.

Geometry, Descriptive. A term employed by Monge to denote a systematized method of geometry, by which a ground-plan and an elevation are made to give the form and dimensions of a building. The projections of a point upon two planes at right angles to each other, called the *planes of projection*, being given, the position of the point itself is given.

GEO'RGIUM SIDUS. The name given by Herschel to the planet discovered by himself in 1781; it is, however, more generally known by the name of its discoverer, or by that of *Uranus.*

GE'OTHERMO'METER (γῆ, the earth, *thermometer*). An instrument invented by Magnus, for measuring the degree of *terrestrial heat* at different places, especially in mines and Artesian wells. The temperature appears to rise 1° F. for every 60 or 70 feet of descent below the surface; hence, at a depth of a few miles, the earth must be in a state of incandescence.

GERANIA'CEÆ. The Geranium tribe of Dicotyledonous plants. Herbaceous plants or shrubs, with stems tumid and separable at the joints; *stamens* monadelphous; *fruit* composed of five cocci, each terminated by an indurated style, consolidated round a long beak-like axis, from which they separate with elasticity, when ripe, by the rolling back of the styles.

GERMAN SILVER. *Packfong.* A white alloy of nickel, formed by fusing together 100 parts of copper, 60 of zinc, and 40 of nickel.

GE'RMEN. The term applied by Linnæus to the *ovary* of plants, or the hollow case forming the base of the pistil, enclosing the *ovules*, and always containing one or more *cells* or cavities.

GERMINA'TION (*germino*, to bud). A term applied by botanists to that function by which the embryo contained in the seed is first called into life.

GEY'SER. A boiling fountain in Iceland, which frequently throws out its contents to the height of more than a hundred feet, sometimes to thrice that elevation.

GIANTS' CAUSEWAY. A columnar basaltic formation on the northern coast of Antrim in Ireland, connected with a trap district which occupies almost the whole of the county, &c., comprehending an area of about 800 square miles on both sides of the valley of the Bann.

GI'BBOUS (*gibbus*, protuberant). Humped; a term applied to the convexity of a solid body, and used in reference to the enlightened parts of the moon, whilst she is moving from her first quarter to the full, and from the full to the last quarter. In Zoology, any part of a shell more particularly elevated above the surface, or unusually so in comparison with other species, is termed gibbous, as in *strombus gibbosus.*

GIE'SECKITE. A granular mineral brought from Greenland by Sir C. Giesecke.

GI'NGLYMOID (γιγγλυμὸς, a hinge, εἶδος, likeness). Hinge-like; a term applied to a joint formed for motion on one plane.

GI'RASOL. A term derived from the Italian *gira-sole*, or *turn-sun*, and applied to a milk-white or bluish opal, which reflects a reddish colour when turned to the sun. The term has been corrupted into *Jerusalem*, as applied to a species of sunflower, the *helianthus tuberosus*, vulgarly said to turn its flowers to the sun.

GLA'CIAL ACID (*glacies*, ice). The strongest acetic acid which can be produced. It exists in a *crystallized* state under 50° Fahr., and contains 79 per cent. of real acid.

GLA'CIER (*glace*, ice). An accumulation of ice and hardened snow, occurring in the valleys and on the slopes of the Alps and other lofty mountains. Saussure distinguishes two kinds of glacier; *viz.* those contained in the valleys more or less deep, and which, though at great elevations, are still commanded on all sides by mountains higher still; and those not contained in the valleys, but spread out on the slopes of the higher peaks. See *Moraine.*

GLA'CIS. A term borrowed from the language of fortification, in which it denotes an easy insensible slope or declivity, less steep than that of a *talus.*

GLAI'RINE. A term referred by some to a gelatinous vegetable matter; by others to a pseud-organic substance formed on thermal waters.

GLANCE (*glanz*, splendour). A designation of certain minerals which have a metallic or pseudo-metallic lustre, as glance-coal, lead-glance, &c.

GLANCE-COAL. *Anthracite.* A variety of coal which burns without flame or smell. It occurs in beds in clay-slate, greywacke, and alum-slate, but most abundantly in secondary rocks, as in coal and trap formations. *Slaty glance-coal* is another variety, called in this country *blind coal.* A third variety occurs in basaltic *columnar* rows, near Cumnock in Ayrshire.

GLAND (*glans*, an acorn). In Botany, a small mass of firm cellular tissue, which is often much harder and more coloured than that which surrounds it. It may be simple or compound, stalked or sessile. Glands are termed *utricular*, when they appear as elevated, distended bladders of the epidermis; *lenticular*, when they exist as brown oval spots upon the bark; *internal*, when of the nature of cysts or nuclei situated below the cuticle; &c. The disk, or fleshy body which surrounds the base of the ovary in certain plants, is commonly called a *hypogynous gland*.

GLANS. In Botany, a compound inferior fruit, with a dry pericarp, one-celled, but proceeding from an ovary which contains several cells, and seated in a persistent involucre called a cupule. The gland is solitary in the oak; in the beech and the sweet chestnut there are several, completely enclosed in the cupule. The gland is termed *calybio* by Mirbel, and *nucula* by Desvaux.

GLASS. The varieties of glass derive their vitreous character from the silicates of potash and soda. *Green* or *bottle-glass* consists of the silicates of alumina, of the oxides of iron, magnesia, and potash or soda. *Flint-glass* is a silicate of potash and lead. *Window-glass* is a silicate of soda and lime. *Plate-glass* used for mirrors, crown-glass, and the beautiful Bohemian glass, are silicates of potash and lime.

The term *glass* is also applied to *glassy* substances, as the *glass of antimony*, or the sulphuret; *Muscovy glass*, or mica; *tin glass*, or bismuth, &c.

GLASS-GALL. *Sandiver*. The salt scum which floats on the surface of fused glass.

GLAUBER'S SALT. Native sulphate of soda, occurring together with rock salt and Epsom salt, on the borders of salt lakes, and dissolved in the waters of lakes and of the ocean, &c. *Glauber's secret sal ammoniac* is a sulphate of ammonia, a constituent of soot from coal.

GLAU'BERITE. A crystallized salt, consisting of nearly equal parts of the sulphates of lime and of soda, and found imbedded in rock salt brought from South America and from Spain.

GLAUCIC ACID (γλαυκὸς, blue, sea-green). An acid procured from the teazle and scabious plants.

GLAU'COLITE (γλαυκὸς, blue, λίθος, a stone). A bluish-green mineral, found near lake Baikal in Siberia, and consisting of a silicate of alumina and lime.

GLAU'CONIE (γλαυκὸς, blue, sea-green). A French term applied by Brongniart to some stratified deposits associated with chalk, which correspond with the *green sands* of English geologists.

GLI'ADINE (γλία, glue). Vegetable albumen; one of the constituents of gluten. See *Zymome*.

GLIMMER. A name occasionally applied to micaceous earths.

GLIRES (*glis*, a dormouse). The fourth order of the Mammalia in the *Systema Naturæ* of Linnæus, comprising the porcupines, hares, beavers, mice, squirrels, bats, &c., characterized by the presence of two long chisel-shaped incisors in each jaw. See *Rodentia*.

GLOBE (*globus*, a ball). A round or spherical body, bounded by one uniform convex surface, every point of which is equally distant from a point within, called the centre.

1. *Artificial Globes* are instruments employed for conveying the first ideas of the figure and rotation of the earth, of latitude and longitude, and of the situation of places with respect to each other and to the sun at the different seasons of the year. They are formed of metal or plaster, on the surface of which is delineated a map of the earth, or of the celestial constellations, together with the principal circles of the sphere; in the former case the instrument is called a *terrestrial*, in the latter a *celestial globe*. These globes are also used for the purpose of solving mechanically a few elementary problems of Astronomy, relative to the difference of the hour of the day at different places, the times of the rising and setting of the sun, the limits of the visibility of eclipses, &c.

2. *Perennial Globe*. A contrivance in which there is a motion of the stars about the pole of the ecliptic, and also one about the pole of the equator, so that all the diurnal phenomena can be represented for any epoch, however distant from our own, past or future.

GLOBULAR CHART. A delineation of the terrestrial surface, or of any part of it, on a plane, according to the principles of globular projection. See *Projection*.

GLOBULAR MASSES. *Nodules*. The geological term for rocks of irregular form, varying from a foot to a mile or more, and imbedded either in a stratified or a massive rock.

GLOBULAR SAILING. In Navigation, the sailing from one place to another over an arc of a great circle, or the shortest distance between the two places.

GLO'BULINE. The name given by Turpin to the amylaceous granules found in the cells of plants. He considers them as the elementary form of vegetable tissue.

GLOBULUS. A little globe; a round deciduous shield, formed of the thallus of lichens, and leaving a cavity when it falls off, as in isidium.

GLO'CHIS (γλωχὶς, a projecting point). A form of hair occurring in plants, and commonly called a *barb;* it is forked at the apex, both divisions of the fork being hooked, as in the nuts of myosotis lappula.

GLOME'RULI (dim. of *glomi*, clews of thread). The heaps of powdery bodies which lie upon the surface of the thallus of lichens. See *Soredia.*

GLOME'RULUS or GLO'MUS. A term applied, in inflorescence, to a cluster of capitula enclosed in a common involucre, as in echinops. It bears the same relation to a capitulum as the compound to the simple umbel.

GLOSSO'LOGY (γλῶσσα, a tongue, λόγος, an account). The science of scientific language; the explanation of the peculiar terms employed in any science.

GLOSSOPE'TRA (γλῶσσα, a tongue, πέτρα, a rock). A term applied to the fossil teeth of fishes allied to the shark, occurring in the upper, secondary, and tertiary strata of England, France, &c. They are also called *odontopetre, lamiodontes*, &c.

GLUCIC ACID (γλυκὺς, sweet). An acid formed by the action of a saturated solution of lime or barytes on grape sugar. The anhydrous acid is formed from grape sugar by the loss of the elements of water.

GLUCI'NA (γλυκὺς, sweet). A rare earth, constituting nearly 14 per cent. of the emerald or beryl. Its metallic basis is *glucinum,* a metal named in allusion to the sweet taste of the salts of its oxide glucina.

GLUCO'SE (γλυκὺς, sweet). A synonymous term for starch sugar, diabetic sugar, grape sugar, or the sugar of fruits.

GLUME (*gluma*, the husk of corn). A term applied to the peculiar envelope of the floral apparatus in grasses, which are hence called *glumaceæ.* It is a modification of the bract.

GLUME'LLE. A diminutive of *glume,* and, as such, applied by De Candolle to each of the bracts of grasses, situated immediately within the glumes; they are commonly called *paleæ.* A further diminutive occurs in *glumellule,* which the same writer applies to the minute hypogynous *scales* situated within the glumelles or paleæ, and which are also called *squamulæ.*

GLU'TEN (*gelo*, to congeal). A viscid substance obtained from wheaten flour. It has been separated into *gliadine*, or vegetable albumen, and *zymome*, or that portion of the mass with which the acid that is present has united. *Glutine* is a principle resembling gluten, but differing from it in not being soluble in alcohol.

GLY'CERIN (γλυκὺς, sweet). The sweet principle of oils, also called hydrate of oxide of *glyceryl*, the hypothetical radical of glycerin.

GLY'PTODON (γλυπτὸς, sculptured, ὀδοὺς, a tooth). A colossal armadillo, occurring in the geological period of the megatheroid animals, remarkable for the complicated structure of its teeth. It resembled the great land tortoise, whose remains are found in the Sewalik hills.

GNEISS. A term applied by the German miners to a stratified primary rock, composed of the same materials as granite, but having usually a larger proportion of mica, and a laminated texture. Three principal kinds of gneiss have been distinguished—the granitic, the slaty, and the laminar.

GNO'MON (γνώμων, a gnomon). In every parallelogram, any of the parallelograms about a diameter, together with the complements, is called a gnomon. The term *gnomon* also designates an upright pillar, from the shadow of which the ancient astronomers determined the altitude of the sun and of the other heavenly bodies. The style or index of a dial is likewise termed a gnomon.

GOBEL'S PYROPHORUS. A mixture of charcoal and lead, in which the latter is in such an extreme state of division, as to take fire on exposure to the air. It is formed by heating the tartrate of lead in a close vessel or tube to dull redness.

GO'BIODÆ (*gobius*, the goby). The Goby tribe; a family of *Acanthopterygious* fishes, distinguished by the thinness and flexibility of their dorsal spines. Many of them are viviparous, as the blenny.

GOLD. A yellow metal, occurring native, in a massive state, and disseminated in veins through rocks, or in grains among the sand of rivers. *Gold coin* is termed *sterling,* when it consists of 22 parts of gold and 2 of copper; *standard,* when it consists of 18 parts of gold and 6 of copper.

GOLD LEAF ELECTROMETER. An instrument for detecting the presence of electricity by the divergence of two slips of gold leaf.

GOLDEN NUMBER. At the end of every nineteen years, the new and full moons happen at very nearly the same times of the year. The ancients ascertained this fact, and reckoned the nineteen years, or "cycle of the moon," as it is called, so that it terminated the year before the Christian era. This cycle was marked by the Greeks with letters of *gold.* Therefore, to find the golden number, or number of the year in this cycle, add 1 to the date; divide by 19; the quotient is the number of cycles of the moon since the birth of Christ, and *the remainder is the golden number.* Thus, $1847+1=1848$. Divide by 19, and the quotient is 97 cycles, and 5 remaining, which is the *golden number* for 1847.

GOLDEN SULPHURET. A sulphuret of antimony, also termed *sulphantimonic acid,* and prepared by precipitating antimonic acid by sulphuretted hydrogen. See *Kermes Mineral.*

GO'MPHOLITE (γόμφος, a nail, λίθος, a stone). A term applied by Brongniart to conglomerate rocks of the tertiary series, called by the Swiss Nägelflue.

GONG. *Tam-tam* of the Chinese. A highly sonorous species of cymbal, consisting of an alloy of about 80 parts of copper and 20 of tin.

GO'NGYLI (γογγύλος, round). The granules contained in the shields of lichens, supposed to be the spores by which the plants are propagated. The term *gongylus* is also applied to a round hard body, which falls off from the mother plant in some of the algaceæ, producing a new individual, as in the fuci.

GO'NIATITES (γωνία, an angle). The name of some spirally twisted species of cephalopods which inhabited the seas during the Carboniferous period, and are characterized by the angular markings made by the intersections of the walls of the chambers and the outer shell.

GONIO'METER. An instrument for measuring angles, particularly those of crystals.

GONIO'METRY (γωνία, an angle, μετρέω, to measure). "The measurement of angles; a name which should be substituted for *trigonometry,* if it were advisable to alter established designations. The latter science, beginning with the measurement of triangles, made all that was known of the analysis of angular magnitude its own peculiar instrument. The various accessions which real goniometry received were, therefore, considered as additions to trigonometry; so that, at this day, under a word which imports measurement of triangles, we have a science which wanders as far from the etymology of its name as geometry does."—*Penny Cycl.*

GO'NOPHORE (γόνος, offspring, φέρω, to bear). The name given by De Candolle to a prolongation of the receptacle, which elevates itself from the base of the calyx of certain flowers, and bears the numerous stamens peculiar to these plants, as in Anonaceæ and Magnoliaceæ.

GO'NOPLA'CIANS (γωνία, an angle, πλάξ, a plate). A tribe of brachyurous crustaceans, named from the genus *gonoplax,* and characterized by the square or rhomboïdal form of the carapace, or upper crustaceous plate, and by the length of the eye-stalks. Some species of the gonoplax are fossil.

GORGO'NIA NOBILIS. Red coral; a substance consisting of an interior stem of gelatinous matter and carbonate of lime, and an external coating of membrane, carbonate of lime, and colouring matter.

GOULARD'S EXTRACT. A saturated solution of subacetate of lead, obtained by boiling powdered litharge in vinegar.

GO'VERNOR. A piece of mechanism applied to steam-engines and other machines, for the purpose of equalizing their motion.

GRACULI'NÆ (*graculus,* a jay). Graculine birds, or Grackles; a term adopted by Macgillivray instead of that of *Thremmaphilinæ,* and applied to a group of birds, allied to the Crows on the one hand, and the Thrushes on the other, including the starling, the cow-bird, &c. By several authors they are called *sturnidæ.*

GRADUATION (*gradus,* a degree). The process of dividing a mathematical or astronomical instrument into degrees, minutes, &c., either by *copying* a system of divisions already existing, or by *original* division, depending on the geometrical properties of the circle.

GRADUATOR. A contrivance for accelerating spontaneous evaporation by exposing large surfaces of liquids to a current of air. This process of *graduation* is sometimes employed in salt works, for the purpose of concentrating the brine, by allowing a shower of it to trickle over fagots.

GRAFTING. The horticultural operation by which a portion of one plant is so applied to another plant that a vital union may take place between them; the portion so applied, is called the *scion;* the rooted plant to which it is applied, is the *stock* or stem. There are various modes of grafting, which have received the names of *whip, cleft, saddle,* and *crown grafting.*

Grafting by approach, or *Inarching,* is a mode of grafting, by which the scion is not separated from its parent plant, until it has become vitally united to the stock.

GRAINER. The ley obtained by the infusion of pigeon's dung in water, employed for imparting flexibility to skins in the process of tanning.

GRALLATO'RES (*grallæ,* stilts). Waders, or Stilt-birds; an order of aquatic birds frequenting marshes, and named from their being raised on their long legs, as on stilts. They comprise the heron, the snipe and woodcock, the rail and coot, and the plover.

GRAMINA'CEÆ (*gramen,* grass). The grass tribe of Monocotyledonous plants. Herbaceous plants with cylindrical stems; *leaves* alternate, with a split sheath; *flowers* hermaphrodite, sometimes monœcious, glumaceous; *glumes* alternate, unequal; *stamens* hypogynous; *ovarium* simple.

GRAMMAR (γράμμα, a letter). That branch of science which relates to the component parts of language, and embraces the subjects of orthography, etymology, syntax, and prosody.

GRA'NITE (*granum,* a grain). An unstratified or igneous, coarse, *granular* rock, occurring generally beneath, or associated with, the oldest of the stratified rocks, and sometimes penetrating them in the form of dikes and veins. It commonly consists of three simple minerals—quartz, felspar, and mica. Several varieties of granite have received distinctive names, as the porphyritic, the graphic, the schorly, the talcose, and the hornblendic.

GRANI'VORÆ (*granum,* a grain, *voro,* to devour). An order of birds, including the *Insessores,* which feed on grains.

GRANULA (dim. of *granum,* a grain). Little grains, a term applied to the large sporules continued in the centre of many Algaceous plants.

GRA'NULATED (*granulatus,* grained). Grained; marked by elevated, closely-set, regular grain-like dots; an appearance very common at the base of the predacious spiral genera of mollusca.

GRANULATION (*granum,* a grain). The division of a metallic substance into *grains* or minute particles, for the purpose of facilitating chemical combination; it is performed by pouring the metal into water, or by agitating it in a closed vessel until the moment of congelation, when it falls into powder.

GRA'PHIC GRA'NITE. A modification of granite, which derives its name from its presenting, when polished, some appearance of written characters. See *Granite.*

GRAPHIC ORE or GOLD. An ore of tellurium, occurring in veins in porphyry, in Transylvania, and consisting of tellurium, gold, and silver.

GRAPHITE (γράφω, to write). Plumbago or black-lead; a carburet of iron, named from its use in writing. *Compact graphite* occurs at Borrowdale in Cumberland, in beds of variable thickness, included in a bed of trap, which is subordinate to clay-slate. *Artificial graphite* is produced by placing an excess of charcoal in contact with fused cast iron.

GRAPSOIDIANS. A tribe of brachyurous crustaceans, named from the genus *grapsus,* and placed by M. Milne Edwards, near the Gonoplacians.

GRA'PTOLITE (γραπτὸς, written, λίθος, a stone). A fossil sertularian coralline, one of the most simply organized of the Silurian species, consisting apparently of the horny skeletons of animals resembling those found on the coral and sea-weed of our own coast. By this term Linnæus designated those stones which are marked with various forms, representing buildings, vegetable structures, as ruin marble, moss-agate, &c.

GRAVI'METER (*gravis,* heavy, μέτρον, a measure). An unclassical term, adopted by M. Greyton in preference to *hydrometer* or *aræometer,* because these terms imply that the substance weighed is a liquid, whereas, when solids are weighed, the liquid is only the term of comparison to which the unknown weight is referred.

GRAVITA'TION (*gravitas,* weight). This term has been sufficiently explained under the head of *Attraction.* The *laws* of gravitation, as laid down by Newton, and universally admitted, are as follows:—The gravitating forces of bodies are to each other, 1, *directly as their masses;*

and 2, *inversely as the squares of their distances.* Thus, if the mass of one body be 2, 3, 4, or 5 times greater than that of another, its gravity is also 2, 3, 4, or 5 times greater; and with a distance of 2, 3, 4, or 5 times greater, the force of gravity will be 4, 9, 16, or 25 times less.

GRAVITY (*gravitas*, heaviness). A name given, in Physics, to the tendency which all bodies have to the centre of the earth. The term is often used synonymously with *attraction*, from which, however, it differs as a species from a genus: we speak, for instance, of capillary attraction and of magnetic attraction, but not of capillary or magnetic gravity.

1. *Gravity, specific.* The density of bodies, as ascertained by comparison with an equal bulk of water, which is assumed as unity, or the *absolute weight.* One substance is said to have a greater *specific gravity* than another, when a less portion of its bulk is of equal weight to that other. Thus, a cubic inch of platinum is nearly twice as heavy as a cubic inch of silver; the specific gravity of the former is, therefore, double that of the latter.

2. *Gravity, centre of.* That point in a body, about which all its parts, in any situation, balance one another. Hence if the body could be suspended from this point, it would remain at rest, with reference to its tendency towards the earth, in whatever respective position the surrounding parts may be turned. Thus, the *centre of gravity* of a globe, if of uniform density, is its common centre, and that of a balanced beam is the pivot on which it turns.

3. *Gravity, line of direction of.* That line which passes through the centre of gravity of a body in a direction to the centre of the earth.

GRAYSTONE. A term suggested for designating certain volcanic rocks composed of felspar, augite, or hornblende, and iron; the felspar being sometimes replaced by leucite or melilite.

GREEK FIRE. An explosive substance, invented by the Greeks, supposed to consist of asphaltum, nitre, and sulphur.

GREEN EARTH. An earthy or granular variety of *chlorite*, which occurs massive, dispersed in rocks, or enclosed in some simple minerals, as rock-crystal, and often in the globular cavities of certain rocks. It is the *mountain green* of artists in water colours.

GREEN MINERAL. A carbonate of copper, employed as a pigment. *Scheele's green* is an arsenite of copper; *Brunswick green*, an oxychloride of copper.

GREENSAND. A designation of beds of sand, sandstone, and limestone, belonging to the Cretaceous Period. They are so named from the abundance of green earth or chlorite which is often scattered through their substance.

GREENSTONE. A variety of trap, consisting of hornblende and felspar, in nearly equal proportions, and having a granitic structure. The name is not very appropriate, for, besides being sometimes greenish, it is not uncommonly reddish or whitish, the colour depending chiefly on that of the felspar, which is generally compact, or at least not highly crystalline. This rock is called *diabase* by the French geologists, who name the compact greenstone *aphanite.*

GREGORIAN TELESCOPE. A reflecting telescope, having a hole in the centre of the great speculum, through which the image is thrown by the small reflector to the eye. The distinctness of the object seen through this telescope is somewhat diminished by the hole in the great speculum.

GRENATITE. *Staurotide.* A designation of the prismatic garnet.

GREYWACKE′ (*grau*, grey, *wacke*, a provincial miner's term). A German designation of some of the most common fossiliferous strata, consisting of a series of arenaceous and slaty rocks, of evidently mechanical origin, intermixed with small beds of limestone. The rocks are very often of a grey colour.

GRIDIRON PENDULUM. Harrison's compensation pendulum, which is constructed of different substances, so combined that the effects of heat counteract each other, and the length of the rod remains unaltered.

GRIT. A provincial name for a coarse-grained sandstone, employed for mill-stones, &c. *Calcareous grit*, or sandstone, is one of the subdivisions of the Middle Oolite Formation.

GROSSIFICA′TION. A term applied to the swelling of the ovary of plants after fertilization.

GRO′SSULAIRE. A green crystallized mineral, found imbedded with vesuvian, in a pale greenish-grey claystone in Siberia.

GROTTO DEL CANE. The Dog's Grotto; a cave in Italy, in which there is a constant natural exhalation of carbonic acid gas, which, occupying the lowest stratum of the air, causes asphyxia in animals introduced into it.

GROUND BASE. In Music, a base consisting of a very few bars, which are continually repeated during the whole movement.

GRU'IDÆ (*grus*, a crane). A family of wading birds, named from the genus *grus*.

GRUMOUS (*grumus*, a clot). Knotted; collected into granular masses, as the fecula in the stem of the Sago palm.

GRUS. The Crane; a southern constellation consisting of fourteen stars.

GRY'LLIDÆ (*gryllus*, a grasshopper). The Grasshopper tribe; a group of orthopterous insects, belonging to the tribe saltatoria, and distinguished by the rooflike position of the elytra, or wing-cases, when these are closed.

GRYPHÆ'A. A genus of bivalves, allied to the oyster, and found abundantly in the secondary strata of Europe from the lias upwards to the chalk, but scarcely known in the tertiary strata.

GRY'PHITE LIMESTONE. A designation of the Lias formation, from the numerous shells of the genus *gryphæa* which it contains.

GUANO. A manure employed in South America, consisting of urate of ammonia and other ammoniacal salts. It appears to consist of the excrements of sea-fowl.

GUIA'NA CURRENT. A branch, or rather a continuation, of the great *equatorial current*, running from Cape St. Roque in Brazil to the Island of Trinidad, along the low coast of Guiana, and at no great distance from it, and lost in the Caribbean sea. Its whole course extends to about 2500 nautical miles. See *Brazil Current*.

GUINEA, or NORTH AFRICAN CURRENT. A current in the North Atlantic, which has its origin in the sea between the southern coast of Ireland and Cape Finisterre in Spain, and ranges along the coast of Guinea. Near its origin, a branch, called *Rennell's Current*, separates itself from the main stream, and performs a complete rotation between Spain, France, and the Atlantic at large.

GULF. A portion of the ocean running up into the land between two promontories, and spreading out into a capacious bay. A *bay* (bow) is a projection of the ocean into the land, but is not necessarily a *gulf*, which includes the idea of a sort of abyss where the waters are *engulfed*, or swallowed up.

GULF STREAM. The name given by navigators to that current of the Atlantic, which traverses the sea between the parallels of 36° and 44° in the northern hemisphere. It enters the gulf of Mexico, through the strait formed by the western end of Cuba and the opposite peninsula, follows the bendings of the Mexican coast, and flows into the gulf of Florida.

GUM. Vegetable mucilage; a common proximate principle of plants. *Gum-resins* are the concrete juices of certain plants, consisting of resin, gum, essential oil, and extractive matter.

GUNPOWDER. An explosive mixture of five parts of nitre, one of sulphur, and one of charcoal, finely powdered, and very accurately blended. The grains are smoothed by friction, and are then said to be glazed.

GUNTER'S LINE. A logarithmic line engraved on scales, sectors, &c., for facilitating the multiplication and division of numbers. The numbers are usually drawn upon two separate rules, which slide against each other. See *Scale*.

GURHO'FFITE. Compact dolomite, occurring in serpentine rocks in Lower Austria.

GUTTA PERCHA. A substance contained in the sap of a tree belonging to the natural order *Sapotaceæ*, abounding in the island of Singapore and in the Malayan peninsula. It is plentiful in Sarāwak, where it is called *Niato*, and is probably to be found over the whole island of Borneo. The substance, as an article of commerce, appears likely to rival caoutchouc in its application to the useful and ornamental arts.

GUTTIFERÆ (*gutta*, a drop, *fero*, to bear). The Mangosteen tribe of Dicotyledonous plants. Trees or shrubs, occasionally parasitical, yielding resinous juice; *leaves* entire, opposite; *flowers* polypetalous; *stamens* hypogynous; *carpels* concrete; *ovary* consisting of several cells.

GYMNOCA'RPOUS (γυμνὸς, naked, καρπὸς, fruit). A term applied to a class of fruits in the arrangement of Mirbel, in which the fruit is not disguised by the adherence of any other organ than the calyx. See *Angeiocarpous*.

GYMNODO'NTES (γυμνὸς, naked, ὀδοὺς, a tooth). A family of the plectognathous fishes, including the spinous globe-fishes, in which the jaws are covered with a substance resembling ivory, arranged in small plates, representing united teeth. These plates are reproduced as soon as destroyed by use.

GY'MNOSPERMS (γυμνὸς, naked, σπέρμα, seed). A class of plants which agree in all respects with Exogens, except that their *ovules*, instead of being enclosed in a pericarp, are exposed *naked* to the fertilizing influence of the pollen, as in the Coniferæ and the Cycadaceæ. See *Angeiospermia.*

GYNÆCE'UM (γυναικεῖον, the woman's part of the house). A term applied by Röper to the entire female system of plants, with reference to the fanciful language of Linnæus. It is commonly called the *pistil*, and comprises the ovary, the style, and the stigma. See *Androceum.*

GYNA'NDRIA (γυνὴ, a woman, ἀνήρ, a man). The twentieth *class* in the Linnæan system of plants, in which the stamens are situated upon the style, above the ovary, as in passiflora.

GY'NOBASE (γυνὴ, a woman, βάσις, a base). A term applied to the receptacle in plants, when it is dilated and supports a row of carpels, which have an oblique inclination towards the axis of the flower, as in Labiatæ, Boraginaceæ, &c.

GY'NOPHORE (γυνὴ, a woman, φέρω, to bear). *Thecaphore.* A term applied, in Botany, to the stalk upon which the ovary is sometimes seated, instead of being sessile, as in tacsonia.

GYNOSTE'MIUM (γυνὴ, a woman, στήμων, a stamen). A term applied by Richard to that condition of the filaments in Orchidaceæ, in which they are combined into a solid body called the *columna.*

GY'PSUM (γύψος, chalk; from γῆ, earth, ἕψω, to bake). Sulphate of lime; a modification of limestone, with a granular or crystalline texture, forming beds and irregular masses, and, when highly burned, constituting *plaster of Paris.* There are two species, according to Jameson,—the prismatic, and the axifrangible.

GY'RATE (γυρὸς, curved). Curved in from apex to base, as the fronds of ferns; a term synonymous with *circinate.*

GYRA'TION (*gyrus*, a circle). The act of turning round a centre, in the manner of a wheel. The *centre of gyration* is that point in a revolving body, into which, if all its matter could be collected, it would continue to revolve with the same energy as when its parts were in their original places.

Gyration, circle of. A wheel in motion may be considered as an indefinite number of pendulums, each of which has its own *centre of oscillation.* If the wheel be nearly balanced, these several points of oscillation will accommodate themselves so as to form, in their continued motion, a set of points equally distant from the rim. These are *centres of gyration*, and in their junction they will form a *circle of gyration.*

GYRO'GONITE (γυρὸς, curved, γονὴ, seed). A term applied to the fossil seed-vessel of plants of the genus *Chara*, found in fresh-water deposits. The name was derived from the idea that they were shells of polythalamous cephalopods.

GYRO'MA (γυρὸς, curved). *Gyrus.* A term sometimes used as synonymous with the *annulus* of the theca of ferns. It is also applied to the shield, or *trica*, of lichens, the surface of which is covered with sinuous concentric furrows.

H

HAA'RKIES (*haar*, German, hair). A designation of capillary pyrites occurring in very delicate acicular crystals. The term is also applied by German mineralogists to a native sulphuret of nickel.

HABITATION. A technical term employed in botany to indicate generally the country where a plant grows wild. It must be distinguished from the term *station.* The study of stations has been styled the topography, that of habitations the geography, of botany. Thus, the *station* of a plant may be a salt-marsh, in a temperate climate, a hill-side, the bed of the sea, or a stagnant pool. Its *habitation* may be Europe, North America, or New Holland between the tropics. See *Station.*

HÆ'MATITE (αἷμα, blood). Bloodstone; a native oxide of iron, so named from its blood-red streak. The *red* hæmatite is an anhydrous, the *brown* a hydrated, peroxide.

HAIDI'NGERITE. An ore of antimony, consisting of sulphuret of antimony and protosulphuret of iron.

HAIL. Drops of rain, more or less suddenly frozen by exposure to a temperature below 32°. They assume various figures, being sometimes round, at other times pyramidal, cuneated, angular, thin and flat, and sometimes stellated with six radii like the small crystals of snow. Hail occurs only in summer or in warm climates, and when the sun is above the horizon.

HAIRS OF PLANTS. Minute filamentous processes found on the cuticle and in certain cavities of plants, consisting of elongated cellular tissue, and constituting, in the cotton plant, the peculiar substance which envelopes the seeds, and is manufactured into linen. The variable qualities of hairs have given rise to various designations, as pilosity, villosity, pubescence, velvet, bristles, stings, glandular hairs, hooks, barbs, &c.

Hairy surfaces are also named, with reference to the quality and form of the hairs, silky, arachnoid, manicate, bearded, rough, and stellate or starry.

HA'LCYON DAYS (*halcyon*, the kingfisher). Originally, the seven days which precede and follow the winter solstice, the period of incubation of the halcyon, generally remarkable for calm weather. Hence the term denotes generally days of calmness.

HALCYO'NIDÆ. *Alcedinæ.* The King-fishers; a family of the *Insessores*, or Perching birds, remarkable for the great length of their bill, and the extreme shortness of their feet. They feed upon small fishes and insects. See *Fissirostres.*

HALIO'TIDÆ (ἅλς, the sea, οὖς, the ear). Ear-shells; a family of the phytophagous Gasteropods, named from the genus *haliotis*, and known by their flat, ear-shaped shells, having only the rudiment of a spire, and without any pillar; hence they may be even called turbinated or spiral limpets.

HALISPO'NGIA. The generic type of a group of sponges, characterized by the presence of siliceous spiculæ, and thus distinguished from the *calcispongia*, which contains calcareous spiculæ, and from *spongia*, which is of a horny tubular structure.

HALLEY'S COMET. A comet named from Edmund Halley, who in 1682 predicted its return in 1759: the event coinciding with the prediction, this comet was first proved to belong to the solar system, and to perform its revolution in 75 or 76 years.

HA'LO (ἅλως, an area). A meteor in the form of a luminous ring, of various colours, appearing round the bodies of the sun, moon, or stars. See *Parhelion.*

HA'LOGENE (ἅλς, salt, γεννάω, to produce). A term employed by Berzelius to denote bodies which form salts with metals, as chlorine, bromine, iodine, fluorine, and cyanogen. The salts thus produced are called *haloïds.*

HALOID SALTS (ἅλς, the sea, sea-salt, εἶδος, likeness). Salt-like compounds, consisting of a metal on the one hand, and of chlorine, iodine, and the radicals of the hydracids in general, excepting sulphur, on the other. Besides the simple haloid salts, Berzelius distinguishes the three following combinations:—

1. *Hydro-haloid Salts*, or combinations of a simple haloid salt and the hydracid of its radical.

2. *Oxy-haloid Salts*, or combinations of a metallic oxide with a haloid salt of the same metal.

3. *Double Haloid Salts*, consisting, 1. of two simple haloid salts, which contain different metals, but the same non-metallic ingredient; 2. of two haloid salts consisting of the same metal, but in which the other element is different; and, 3. of two simple haloid salts, of which both elements are entirely different.

HA'MITE (ἅμη, *hamus*, a reaping-hook). A genus of fossil cephalopods, with chambered shells bent in the form of a hook or siphon, with parallel but unequal limbs and sinuous septa, occurring in the galt, greensand, and other cretaceous beds.

HARDNESS OF MINERALS. The comparative hardness of minerals is tested by reference to a scale of substances formed by Mohs. The hardness of a mineral which neither scratches nor is scratched by any particular substance in this scale, is expressed by the *number* prefixed to that substance. They are 1, talc; 2, rock salt; 3, calcareous spar; 4, fluor spar; 5, apatite; 6, adularia; 7, rock crystal; 8, topaz; 9, corundum; 10, diamond. The hardness of minerals is also tested by the application of a file.

Hardness of Rocks. This character does not require so precise a determination as in the case of simple minerals. The extremes are the hardness of quartz on the one hand, and soft chalk on the other.

HARMO'NICON, CHEMICAL. An apparatus for imparting a sonorous property to the air. If a small flame of hydrogen gas be made to burn in a tube of glass or of any other material, of from one to three inches in width, the column of air contained in the tube will in a short time be heard to give forth musical sounds. These are occasioned by the combustion of the hydrogen in the atmospheric air contained in the tube, and thus an influx of the surrounding atmosphere is produced. The sounds are heard when the flame of the hydrogen becomes small and steady.

HARMO'NICS (ἁρμονία, concord). The doctrine of harmonical combinations in music, as they occur in the natural series, 1, 2, 3, 4, &c. Thus, the first interval, 1 : 2, is an octave; the second, 1 : 3, is a twelfth; the third, 1 : 4, is a fifteenth; the fourth, 1 : 5, a seventeenth; the fifth, 1 : 6, a nineteenth; &c.

HA'RMONY (ἁρμονία, concord). A combination of sounds, forming a musical chord, or a succession of chords. The *harmonic triad*, or common chord, consists of a note, with its third and perfect fifth, and is the result of the vibration of all sonorous bodies.

HA'RMOTOME (ἁρμὸς, a joint, τομὴ, a section). A silicate of barytes and alumina, containing water, found at Andreasberg in the Hartz: the crystals of this mineral intersect one another lengthwise, and are easily separable. It is also called *staurolite*, or cross-stone.

HARPA'LIDÆ. A family of Coleopterous insects of the section Geodephaga, named from the genus *Harpalus*, distinguished by the tarsi of the two anterior pairs of legs being dilated in the male sex.

HARVEST and HUNTERS' MOON. Twice in the year the moon rises almost at the same hour during a week. This occurs in September or October, and in March or April: in the former case the moon is termed the *harvest moon*, in the latter the *hunters' moon*.

HA'STATE (*hastatus*, spear-shaped). A term applied, in Botany, to leaves which have three lance-shaped lobes, one in the direction of the midrib, the other two at the base, at right angles to the first, as in arum maculatum.

HASTINGS SAND. The middle group of the Wealden formation, constituting the uppermost part of the Oolitic system in England, and occurring around Hastings in Sussex. It consists of yellowish grains of sand, very loosely coherent, alternating with beds of clay and conglomerate, containing fragments of bones and scales of fishes.

HA'TCHETINE. *Mineral adipocire.* A wax-like substance occurring in the nodules of iron-stone in South Wales, and named after Mr. Hatchett.

HAUSMA'NNITE. A designation of pyramidal manganese ore.

HAUSTELLA'TA (*haustellium*, a proboscis). Haustellate insects; a group in which the mouth is furnished with a *haustellium*, or proboscis, adapted for suction. This division includes the homopterous, heteropterous, lepidopterous, and dipterous insects. See *Mandibulata.*

HAÜYNE. *Latialite.* A blue mineral, occurring in basalt or lava, and named from the mineralogist Haüy.

HAY'TORITE. A variety of rhomboidal quartz, containing 0·5 per cent. of oxide of iron.

HEADLAND. Any projection of the land into the sea. Thus, a *cape* is a headland, and is distinguished in each case by a particular designation; a *promontory* is also a headland, but, in accordance with its Latin derivation, is applied only when the projecting head is a high point or a rock.

HEART-WHEEL. A mechanical contrivance employed in cotton mills for converting a circular into an alternating rectilinear motion. It consists of a revolving ellipse, on the edge of which a moveable point or circle presses; the latter receives an alternating motion from the circumference of the ellipse, which in its revolution presses it to different distances from the centre of motion.

HEART-WOOD. The popular name for the hard interior portion of the stem and branches of exogenous trees, as distinguished from *sap-wood*, or the exterior and softer portion. In botany the former is termed *duramen*, the latter *alburnum.*

HEAT. In popular language, the *sensation* experienced on touching a body of a higher temperature than that of the blood. In chemical language, it is the *cause* of that sensation, or *caloric*, a term by which philosophers distinguish the *matter* of heat from its *effect.*

HEAVY SPAR. Another name for *baryta*, the heaviest of all the earths.

This genus has been distinguished into four species; viz. 1. the rhomboidal or *witherite*, which is a carbonate of baryta, occurring in lead veins; 2. the prismatic, or *heavy spar*, or sulphate of baryta, found in primitive and transition rocks, in secondary limestone, and in lead mines; 3. the di-prismatic or *strontianite*, a carbonate of strontia occurring in veins which traverse gneiss; and 4. the axifrangible or *celestine*, a sulphate of strontia, occurring in trap-tuff and in red sandstone.

HEDENBER'GITE. A variety of *augite*, of a dark-green colour, sometimes nearly black: it resembles those hornblendes in which iron prevails, and is found in Sweden.

HE'DYPHAN. A phosphate of lime, in which a portion of phosphoric acid is replaced by arsenic acid.

HE'GIRA. This mode of computing time among the Mahomedans has been noticed under the article *Era*. It may here be added, that the years of the Hegira are divided into cycles of thirty years, nineteen of which are termed common years, of 354 days each, and the other eleven are called intercalary, or abundant, from their consisting of one day more. To reduce the Christian era to the Mahomedan, subtract 622 from the current year; multiply by 1·0307; cut off four decimals, and add ·46: the sum will be the year and decimal of the day, Old Style.

HEIGHT. This term, in Geometry, is synonymous with *altitude*, and denotes the perpendicular let fall from the vertex, or top, of any rectilinear figure, upon the base or side subtending it. It also represents the position of any object, in a vertical direction above the horizon.

The *measurement of heights* is generally effected by observing the differences of atmospheric pressure as indicated by the barometer. In 1815, Capt. Smith ascertained, trigonometrically, that the height of Etna was 10,874 feet. In 1824, Sir J. Herschel determined, by barometrical measurement, that the height was 10,872½ feet. This singular agreement of results, so differently obtained, was spoken of by Herschel as "a happy accident;" but Wollaston remarked that "it was one of those accidents which would not have happened to two fools."

HE'LIACAL (ἥλιος, the sun). A term applied to the rising and setting of a star, when it *rises* in the morning a little before the sun, or *sets* in the evening a little after him. It is only in his heliacal rising and setting that the planet Mercury is ever visible to the naked eye. See *Cosmical*.

HELIANTHOI'DA (*helianthus*, the sun-flower, εἶδος, likeness). An order of the polypipherous Radiata, named from their resemblance, when expanded, to the sun-flower. They are also termed *actiniform* polyps, from their general resemblance to the sea-anemone.

HELI'CIDÆ (*helix*, a snail). Snails; a family of phytophagous *Gasteropods;* these are pulmonary animals, breathing by a lateral opening; the shell is light, turbinated, or spiral; the aperture always entire, rarely closed by an operculum, and sometimes only rudimentary.

HELI'CINÆ. Common Land Snails; a sub-family of the *Helicidæ*, having perfect turbinated shells more or less depressed; the aperture entire, but without teeth.

HE'LICOID (ἕλιξ, a helix, εἶδος, likeness). *Parabolic spiral*. In Geometry, a curve generated by the bending of the axis of the common parabola into the circumference of a circle, the ordinates still retaining their places and perpendicular positions with respect to the circle, all these lines still remaining in the same plane. The equation of this curve remains the same as when it was a parabola.

HE'LIOCE'NTRIC (ἥλιος, the sun, κέντρον, a centre). Having the sun as a centre; a term applied to the place of a planet, as seen from the centre of the sun, and opposed to its *geocentric* place, as seen from the centre of the earth.

1. The *heliocentric longitude* of a planet is the angle at the sun's centre formed by the projection of its radius vector on the ecliptic, and the straight line drawn from the centre of the sun to the first point of Aries.

2. The *heliocentric latitude* of a planet is the inclination of a line drawn between the centres of the sun and the planet, to the plane of the ecliptic.

HELIO'GRAPHY (ἥλιος, the sun, γράφω, to write). *Photography*. A method of giving permanency to images obtained by means of convex lenses, by the chemical effects of light.

HELIO'METER (ἥλιος, the sun, μέτρον, a measure). A kind of micrometer invented by M. Bouguer for measuring the diameters of the heavenly bodies.

HE'LIOSCOPE (ἥλιος, the sun, σκοπέω, to observe). A telescope invented by Scheiner, for making observations on the sun without injuring the eye. The usual method is to place a disc of coloured glass before the eye-piece of the instrument.

HE'LIOSTAT (ἥλιος, the sun, στάσις, a placing or setting). An instrument by which the sun-beam can be steadily directed to one spot during the whole of its diurnal period.

HE'LIOTROPE. A sub-species of rhomboidal quartz, found in rocks belonging to the secondary trap formation. It is termed *bloodstone*, from the blood-red specks which occur on its green surface, owing to disseminated jasper.

HELIX (ἕλιξ, a spiral). A spiral, or winding line; a coil of wire used in magneto-galvanic experiments.

HELO'PIDÆ. A family of coleopterous insects, of the section heteromera and sub-section stenelytra, named from the genus *helops*, several species of which abound in England, living in rotten wood and under the bark of trees.

HE'LVINE. A sub-species of dodecahedral garnet, found in beds subordinate to gneiss, in Saxony.

HE'MATOSIN (αἷμα, blood). This and *globulin* are two of the most characteristic constituents of the blood, both closely related to albumen.

HEMATO'XYLIN. The colouring matter of logwood, the wood of the *Hematoxylon campeachianum:* it was named *hematin* by Chevreul, who first distinguished it.

HEMERO'BIANS (ἡμέρα, day, βίος, life). A family of neuropterous insects, of the section *planipennes* of Latreille, named from the typical genus *hemerobius*, and, like the ephemeræ, of very short existence.

HEMI- (ἥμισυς, half). A Greek term frequently employed in composition to denote *half*, and synonymous with the Latin *semi:*—

1. *Hem-elytra* (ἔλυτρον, a sheath). A wing, of which one half is opaque and firm, like an elytrum.

2. *Hemi-gyrus* (γῦρος, a circle). A term applied in carpology, by Desvaux, to the fruit of Protæaceæ. It differs little from the *follicle* of other writers.

3. *Hemi-hedral* (ἕδρα, a seat). A term applied to a variety in some forms of crystals (particularly those of which the cube and the rhomboid are the primary), characterized by the existence of only half the number of faces belonging to any particular modification, which the law of symmetry requires. These hemihedral forms are *parallel* or *oblique*, according to the relative position of the existing and omitted faces. The pentagonal dodecahedron is an example of the former kind, and the tetrahedron, of the latter. As the tetrahedron contains half the planes by which the octahedron may be derived from the cube, it has been sometimes called the *hemi-octahedron.*

4. *Hemi-ptera* (πτερὸν, a wing). An order of insects, in which the anterior or upper pair of wings are coriaceous in their texture through one half of their extent, the posterior portion being thin and membranous, as in the *notonecta*, or water-boatman.

5. *Hemi-sphere* (σφαῖρα, a sphere). A half-sphere, produced by cutting a sphere through the centre by a right line in any direction; thus the equator divides the sphere of the earth into the northern and southern, the eastern and western, the upper and lower, hemispheres.

6. *Hemi-tone* (τόνος, tone). An interval in ancient music, the ratio of which is $\frac{243}{256}$.

7. *Hemi-trope* (τρέπω, to turn). A term applied by Haüy to twin crystals, from their being generally conceived to result from cutting a crystal in halves, and turning one portion half round on the other. The plane common to the two portions of the crystal is called the *twin* plane, and is parallel either to one of the primary planes, or to a secondary plane resulting from some simple law of decrement. These crystals may frequently be recognized by the existence of notches, called *re-entering angles*, or by lines on the surface, which point out the position of the twin plane.

HE'PAR (ἧπαρ, the liver). A term formerly applied to the combinations of sulphur, from their *liver*-like appearance. Thus we had *hepar sulphuris*, a sulphuret of potash; *hepar antimonii*, an oxysulphuret of antimony; *hepar calcis*, a crude bisulphuret of calcium, &c.

HEPA'TIC (ἧπαρ, liver). A term applied to various substances of a brown or *liver-like* colour. *Hepatic pyrites* is a variety of prismatic iron pyrites, which becomes brown on exposure to the air. *Hepatic cinnabar* is a dark-coloured, steel-grey variety of cinnabar. *Hepatic air* is another name for sulphuretted hydrogen gas.

HEPA'TICÆ (ἧπαρ, ἥπατος, the liver). The Liver-wort tribe of Acotyledonous plants. Cellular, *flowerless* plants, consisting of an axis or stem, either leafy or bordered: *reproductive organs* are valved *thecæ* of different kinds.

HE'PATITE (ἧπαρ, liver). A variety of heavy spar, or sulphate of barytes, containing a minute portion of sulphur, and emitting, when heated or rubbed, a fetid sulphurous odour.

HE'PATULE (ἧπαρ, liver). The name given by Kirwan to the *hydrosulphuret* of other writers.

HE'PTAGON (ἑπτὰ, seven, γωνία, angle). In Geometry, a plane figure of seven sides. The area of a regular heptagon is equal to the square of one of its sides multiplied into the constant number 3.6339124, or seven-fourths of the tangent of the angle at the base to radius 1.

Heptagonal Numbers. A kind of polygonal numbers in which the difference of the terms of the corresponding arithmetical progression is 5, thus,—

Arithmeticals—1, 6, 11, 16, 21, 26, &c.

Heptagonals— 1, 7, 18, 34, 55, 81, &c., where the heptagonals are formed by adding continually the terms of the arithmeticals, above them, whose common difference is 5.

HEPTAGY'NIA (ἑπτὰ, seven, γυνὴ, a woman). The name of those *orders* of plants in the system of Linnæus, which are characterized by the presence of seven pistils.

HEPTA'NDRIA (ἑπτὰ, seven, ἀνὴρ, a man). The seventh *class* of the Linnæan system of plants, characterized by the presence of seven stamens.

HERBA'RIUM (*herba*, a herb). A collection of dried specimens of plants, formerly known by the expressive term *hortus siccus*, or dried garden.

HER'CULES. *Eugonasia.* A northern constellation, consisting of 113 stars. This constellation has also been named *Hercules cum Ramo et Cerbero.* Its principal star is called Ras Algratha.

HE'RDERITE. The prismatic fluorhaloid of Mohs; a mineral found in crystals imbedded in fluor, in Saxony, and named from Herder, its discoverer.

HERMA'PHRODITE (Ἑρμῆς, Mercury, Ἀφροδίτη, Venus). A term applied, in Botany, to plants in which the stamen and the pistil are contained in the same flower; all other flowering plants being termed *unisexual*, as monœcious and diœcious plants.

HERME'TIC SEAL. The closure of the end of a glass vessel when heated to the melting point. The name is derived from the Egyptian Hermes, supposed to have been the father of chemistry, which has hence been called the Hermetic art.

HERO'S FOUNTAIN. An apparatus in which the compression of air is employed to produce a jet of water. *Hero's Ball* is a similar contrivance for the same purpose. *Hero's steam-engine* is a contrivance for producing a rotatory motion by means of steam, and was invented 120 years before the present era.

HERPETO'LOGY (ἑρπετὸν, a reptile, λόγος, a description). That branch of Zoology which treats of the structure, history, and classification of *Reptiles.*

HER'SCHEL or U'RANUS. The most remote, but one, of the planets, accomplishing its revolution round the sun in eighty-four years. Its time of diurnal rotation is not determined.

HE'RSCHELITE. A mineral found in olivine, brought by Mr. Herschel from Sicily.

HESPE'RIDIN. A crystalline substance, obtained from the skin of the unripe orange or lemon.

HESPERI'DIUM. A many-celled, superior, indehiscent fruit, covered by a spongy separable rind, as the orange.

HE'TEPOSITE. A phosphate of iron and manganese, found at Haute Vienne.

HE'TERO- (ἕτερος, the other, one of two). A Greek term, in composition generally denoting *difference*, and thus distinguished from the term *homo-*, which indicates *resemblance*:—

1. *Hetero-branchiata* (βράγχια, gills). The name given by Blainville to the fourth order of his *Acephalophora.*

2. *Hetero-carpien* (κάρπος, fruit). A term applied by Desvaux to that kind of fruit which is more commonly called *inferior*, from its contracting adhesions with other organs. On the same principle, he designated *superior* fruits as *auto-carpien*, owing to their freedom from such adhesions.

3. *Hetero-cephalous* (κεφαλὴ, the head). A term applied by De Candolle to those plants in which some of the *capitula* are composed entirely of male flowers, and others entirely of female flowers.

4. *Hetero-cercal* (κέρκος, a tail of a beast). A term applied to the tail of all the palæozoic fishes: their back-bone runs to a point above the tail, which is placed bebelow, like a triangular rudder. This structure is still seen in our sharks, sturgeons, and in the sauroids of the

North American lakes (bony pike). See *Homo-cercal.*

5. *Hetero-gamous* (γάμος, marriage). A term applied, in Botany, to those *capitula* in which the outer flowers are neuter or female, and the inner hermaphrodite or male: when all the flowers are hermaphrodite, the capitulum is termed *homo-gamous.*

6. *Hetero-gangliata* (γάγγλιον, a nerve-knot). A term applied by Owen to Cuvier's grand division *Mollusca* of the animal world, the beings of this division having a ganglionic nervous system, and the ganglions scattered often unsymmetrically. These are the *cyclogangliata* of Grant. See *Homo-gangliata.*

7. *Hetero-geneous* (γένος, kind). A term applied to substances the parts of which are of different kinds, and therefore of different qualities.

8. *Hetero-mera* (μέρος, a part). A section of *coleopterous* insects, in which the tarsi are differently parted, the four anterior being five-jointed, the two posterior four-jointed.—*Latreille.*

9. *Hetero-morphous* (μορφὴ, form). Of an irregular or unusual form; a term applied to the larvæ of certain insects which differ in form from the imago, and applicable to the true larval state of all insects.

10. *Hetero-phyllous* (φύλλον, a leaf). A term applied to those plants in which the leaves are not of the same kind as regards form, &c.

11. *Hetero-poda* (πους, ποδὸς, a foot). A small order of *Gasteropods,* including certain families in which the foot is so much compressed, as to constitute a vertical muscular lamella, which presents merely a remnant of the ventral sucker, so characteristic of the entire class, and which can only be serviceable in performing the office of a fin used in swimming.

12. *Hetero-ptera* (πτέρον, a wing). An order of insects in which the two pairs of wings are of different consistence, the anterior pair being horny or leathery, but generally tipped with membrane. They comprise the land and the water-bugs.

13. *Heter-organa* (ὄργανον, an organ). By this term, and that of *hom-organa,* Schultz has divided the vegetable kingdom into two primary classes, with reference to the *Rotation,* or general motion of the sap: the latter class consisting wholly or in great measure of cellular tissue, and containing all the cellular flowerless, and some flowering, plants of a low organization; the former all the higher flowering plants, and the vascular flowerless.

14. *Hetero-scii* (σκιὰ, a shadow). This and some similar terms, as *amphi-scii* and *peri-scii,* are of old date, but still remain in works on the use of the globes. The first are the inhabitants of the two temperate zones, the noon-day shadows of each being always thrown one way, but those of the two being always in different ways. The second are the inhabitants of the torrid zone, who have their noon-day shadows sometimes cast north, sometimes south. The third are the inhabitants of the frigid zones, whose visible shadows make complete revolutions.

15. *Hetero-tropal* (τρέπω, to turn). That which has its direction across the body to which it belongs, as applied, in Botany, to the embryo of the seed, as in primrose.

HEU'LANDITE. A mineral formerly ranked among the zeolites, consisting of silica, alumina, and lime, and found in the Faroe Isles, the trap of the Giants' Causeway, &c.

HE'XAGON (ἕξ, six, γωνία, an angle). In Geometry, a plane figure bounded by six sides, and consequently having six angles. The side of a regular hexagon is equal to the radius of its circumscribing circle. The area is equal to the square of the side multiplied into the constant number 2.598076; that is, into three times half the tangent of 60°.

HEXAGY'NIA (ἕξ, six, γυνὴ, a woman). The name of those *orders* of plants in the Linnæan system, which are characterized by the presence of six pistils.

HEXAHE'DRON (ἕξ, six, ἕδρα, a seat). A cube, or a solid geometrical figure, having six faces. The whole surface of a hexahedron is equal to 24 times the square of the radius of the inscribed sphere, and to 8 times the square of the radius of the circumscribed sphere. Its solid content is 8 times the cube of the inscribed sphere.

HEXA'NDRIA (ἕξ, six, ἀνὴρ, a man). The sixth *class* of plants in the system of Linnæus, characterized by the presence of six stamens.

HE'XAPOD (ἕξ, six, ποὺς, ποδὸς, a foot). Six-footed; a term applied to animals with six legs, as the true insects Hence, the term *Hexapoda* has been apapplied by Mr. Kirby to a sub-order of apterous insects, including those which have no more than six legs.

HIERA'TIC WRITING (ἱερὸς, sacred). A mode of writing employed by the priests of Egypt, consisting in an abridged form of the hieroglyphic characters, adopted for the sake of convenience and expedition, and sometimes found attached to mummies.

HIERO'S FOUNTAIN. An apparatus for raising water, which acts by the elasticity of the air, and on the same principle as the fire engine.

HIEROGLY'PHICS (ἱερὸς, sacred, γλύφω, to engrave). Sacred engravings; a term applied to a mode of sculpture-writing employed in Egypt, and consisting of the images of visible objects, chiefly used in monumental inscriptions. Champollion distinguishes three kinds of characters, viz.—

1. The *hieroglyphic*, properly so called, in which the figure represents the object itself, entire or in an abridged form. These are termed *figurative*, and are distinguished into figurative proper, figurative conventional, and figurative abridged.

2. The *symbolical*, in which the figure of a visible object represents an idea; thus a censer represents adoration, the hawk's eye omniscience, a circle eternity. Here, the symbol indicates an abstract idea, a type suggests an antitype.

3. The *phonetic*, in which the figure represents neither an object nor an idea, but a sound. Thus the letter A suggests the term "eagle," being the initial letter of *ahorn*, the Egyptian term for that animal. Twenty-nine elementary sounds were thus represented.

HIGH PRESSURE ENGINE. A variety of the Steam Engine, in which the water is heated till it acquires an expansive force of from two to ten atmospheres.

HIGHGATE RESIN. Fossil Copal; found in the bed of blue clay at Highgate, near London. It is imbedded in the clay in detached nodules.

HI'LOFERE. A term applied by Mirbel to the internal integument of the seed, from the insertion of the *hilum* on this part of the testa.

HI'LUM. *Umbilicus*. The point of the seed by which it is attached to the placenta. This is the *base* of the seed.

HINGE MARGIN. The hinge of bivalves, composed of the ligament, the cartilage, and the teeth. See *Dorsal*.

HI'PPIDES. The *Hippa* tribe; the name by which Latreille designates a tribe of the macrourous decapod crustaceans, comprising the genera remipes, albunea, and hippa, animals of peculiar forms, adapted for burrowing in sand.

HIPPOBO'SCIDÆ (ἵππος, a horse, βόσκω, to feed). Forest-flies, or spider-flies of the French; a family of dipterous pupiparous insects, parasitic on birds and quadrupeds, of which the *tick* among sheep is a well-known example.

HIPPOTHE'RIUM (ἵππος, a horse, θηρίον, a beast). An extinct quadruped allied to the horse, found in sand at Epplesheim, and belonging to the second or miocene period of the tertiary formation.

HIPPU'RIC ACID (ἵππος, a horse, οὖρον, urine). An acid obtained from the urine of the horse, the cow, and other graminivorous animals, when mixed with muriatic acid in excess. It resembles benzoic acid, but contains nitrogen; the salts of the two acids are, moreover, distinct.

HI'PPURITES. A fossil coral belonging to the Eifel transition limestone, and characteristic of the rocks of the cretaceous era in many parts of Europe. It is considered to be a bivalve, and is referred by Lamarck to the group of *rudista*.

HI'RCIN (*hircus*, a goat). A substance, similar to butyrine, contained in the fat of the goat and the sheep, combined with olein, and yielding, by saponification, the *hircic acid*.

HIRUNDI'NIDÆ (*hirundo*, a swallow). The Swallow tribe; a family of the *Insessores*, or Perching birds, characterized by the great length of their wings and the rapidity of their flight. (See *Fissirostres*.) By Macgillivray, these birds are placed in a group, belonging to an order which he names *Volitatrices*, or gliders.

HISI'NGERITE. A black massive mineral, found in the cavities of calcareous spar.

HISTO'LOGY (ἱστὸς, a tissue, λόγος, a discourse). The doctrine of the tissues which enter into the formation of an animal and its various organs.

HOAR-FROST. This is an insensible transition from dew, being, in fact, frozen dew, and indicative of greater cold.

HO'LMITE. A new mineral, consisting of carbonate of lime, named after Mr. Holme, who analyzed it.

HOLOTHU'RIDÆ (ὁλοθούριον, a kind of *zoophyte*, Arist.). A family of Echinoderms, commonly termed, from their general shape and appearance, "sea-cucumbers." See *Echinodermata.*

HOMBERG'S PHOSPHORUS. Ignited muriate of lime. See *Phosphorus.*

HOMBERG'S PYROPHORUS (πῦρ, fire, φέρω, to bring). A mixture of alum and brown sugar, which takes fire on exposure to the air. A more convenient mixture is made with three parts of lampblack, four of burnt alum, and eight of carbonate of potash.

HOMBERG'S SEDATIVE SALT. A name for boracic acid, which appears, however, to possess no sedative property.

HO'MO- (ὁμὸς, one and the same). A Greek term, in composition denoting *resemblance,* and thus distinguished from the term *hetero-*, which denotes difference :—

1. *Homo-centric* (κέντρον, a centre). Having the same centre, or being *concentric.*

2. *Homo-cercal* (κέρκος, the tail of a beast). A term applied to those fishes which have tails with rays regularly diverging from the end of the backbone, like the tail of a herring or trout. See *Hetero-cercal.*

3. *Homo-dromal* (δρόμος, a course). A term recently suggested, in Botany, to characterize the peduncles of the cyme of monocotyledons, in which the direction of the spire is the same as that of the central stem, and as distinguished from the *anti-dromal* direction, which is the reverse of that of the central stem.

4. *Homo-gamous* (γάμος, marriage). A term applied, in Botany, to those capitula, in which all the flowers are hermaphrodite.

5. *Homo-gangliata* (γάγγλιον, a nerve-knot). A term applied by Owen to Cuvier's grand division *Articulata* of the animal world; the beings constituting this division having a ganglionic nervous system, and the ganglions symmetrically arranged. They correspond with the *annulosa* of Macleay, and the *Diploneura* of Grant. See *Hetero-gangliata.*

6. *Homo-geneous* (γένος, kind). A term applied to substances consisting of similar parts and properties, as distinguished from *hetero-geneous* substances. Thus, in minerals, sandstone is a homogeneous, granite a heterogeneous substance.

7. *Homo-logous* (λόγος, a ratio). Having the same ratio or proportion. Equiangular triangles, having sides containing corresponding equal angles proportional, are said to be *similar,* and the corresponding sides are *homo-logous, i. e.* having the same ratio. Similar magnitudes, occupying different places in a proportion, one being an extreme, the other a mean, are said to be *homo-logous.*

8. *Homo-logue* (λόγος, a description). The same organ in different animals under every variety of form and function.

9. *Homo-morphous* (μορφὴ, form). Of similar form; a term proposed by Mr. Westwood for certain neuropterous insects, which, in their larva state, are similar in form to the perfect insect, though wingless.

10. *Homo-phonous* (φωνὴ, a sound or voice). A term applied, in Music, to two or more sounds which are exactly of the same pitch. In language the term is applied to words or syllables which have the same sound, though they are expressed in writing by various combinations of letters.

11. *Homo-ptera* (πτέρον, a wing). An order of insects in which the four wings are of the same consistence, all of them being composed of a firm membrane, as in the lantern-fly.

12. *Hom-organa* (ὄργανον, an organ). One of the primary classes of plants, as divided with reference to their *Rotation,* or general motion of the sap. See *Heter-organa.*

13. *Homo-tropal* (τρέπω, to turn). Having the same direction as the body to which it belongs, but not being straight, as applied, in botany, to the embryo of a seed.

HONEY-DEW. A sweetish substance ejected by very small homopterous insects, called aphides, upon the leaves of plants, and vulgarly supposed to be caused by a *blight,* or some disease in the plant. There is another kind of *honey-dew,* observed only at particular times, and in certain states of the atmosphere, hanging occasionally in drops from the points of the leaves of plants; its cause is not known.

HONEY-STONE. *Mellite.* Mellitate of alumina; a mineral of a honey-yellow colour, found situated on bituminous wood and earth coal, and usually associated with sulphur.

HO'RARY (*hora,* an hour). This term, as used in astronomy, denotes the arc which a celestial body describes in one hour, or the angle which that arc subtends at the eye of the spectator: the horary motion of a celestial body is therefore 15°, or the twenty-fourth part of a circle.

but the plane of the visible horizon is not tangent of the spheroid

Horary circles, on globes, are hour lines, or circles marking the hours; they are drawn at the distance of 15° on the equator from each other. They are the same as *meridians*.

HO'RDEIN (*hordeum*, barley). A vegetable product found in barley, supposed to exist only in the husk; it is a peculiar modification of starch.

HORI'ZON (ὁρίζω, to bound). That which *bounds* any thing, particularly the line which bounds our view of the earth and heavens.

1. The *sensible horizon* is a plane tangent to the globe at the point where the observer is stationed. It is the plane of the circle which bounds our view. When the sun rises, he appears above the sensible horizon; and when he sets, he sinks below it.

2. The *rational horizon* is a plane passing through the centre of the earth parallel to the sensible horizon. It is that line which would bound our view, if we could see at once half the globe. It is represented on the terrestrial globe by the wooden circle which surrounds it.

HORN. A substance consisting of coagulated albumen and gelatine. It differs from bone in containing only a trace of earth.

HORN SILVER. *Luna cornea.* The chloride of silver: the term is derived from its forming a grey semi-transparent mass, which may be cut with a knife, and much resembles horn.

1. *Horn Lead.* Plumbum corneum; the chloride of lead, a semi-transparent mass, resembling horn.

2. *Horn Quicksilver.* A natural protochloride of quicksilver, having a white horn-like appearance.

HORNBLENDE. *Amphibole.* A silicate of lime and magnesia; a simple mineral, of a dark-green or black colour, which enters largely into the composition of several varieties of the Trap-rocks. There are three varieties, *viz.*, common hornblende, hornblende-slate, and basaltic hornblende.

1. *Hornblende-rock.* The primitive greenstone of many writers; a crystalline compound of hornblende and felspar, not laminar nor fissile, but massive, although generally disposed in strata.

2. *Hornblende-slate.* A primary rock, generally of a distinct slaty structure, composed of crystals of hornblende, often intermixed with felspar, and passing through numerous varieties into actinolite-slate.

3. *Hornblende Schist.* A term applied by M'Culloch to a variety of mineral aggregates in which hornblende abounds, and which are mostly, but not universally, of laminated structure.

4. *Hornblendic Clay-slate.* A rock of the Cumbrian group, not composed of hornblende and felspar, like the primary hornblende-slate, but of clay-slate, in which are interspersed crystals of hornblende and actinolite.

5. *Hornblendic Granite.* A variety of granite, in which hornblende is substituted for mica. Frequently, however, both these substances are associated in granite, and the hornblendic gradually passes into the common granite. See *Syenite.*

HORNSTONE. A siliceous mineral substance, sometimes approaching nearly to flint or common quartz. It has a conchoidal fracture, and is infusible, by which characters it is distinguished from common felspar. It has been distinguished into the splintery, the conchoidal, and woodstone.

HOROLO'GIUM. The Horologe or Clock; a southern constellation, consisting of twelve stars. It is cut by a line passing through Canopus to the southern part of Eridanus.

HORO'LOGY (ὥρα, an hour, λόγος, a description). A description of the principles adopted for the measurement of time, and of the various machines employed for this purpose. These comprise the clepsydra and other horologia of the ancients, and the several kinds of watches and clocks of modern times.

HO'ROSCOPE (ὥρα, an hour, σκοπέω, to consider). An astrological scheme of the twelve signs of the zodiac at any particular hour, supposed to indicate the future destinies of any individual by their aspect at the moment of his birth. The signs were called *Houses*, as being the monthly abodes of the sun, and, besides, every house was appropriated to some planet, every planet having two. In a more particular application the *Horoscope* denoted the point and sign of the Ecliptic which rose above the horizon at the hour in question; that point was the *Ascendant;* and the planet to which the sign was appropriated was termed the *Lord of the Ascendant*, and had its influence over the fate of the new-born child.

HORSE-POWER. A mode of measuring the performance of a steam-engine by reference to the useful effect which one horse would produce during his ordinary work. Various values have been affixed to this unit of comparison; but it is now generally estimated as a force which would be capable of raising a weight of 33,000 lbs. a height of one foot per minute, or 550 lbs. per second; and, on a railway, as a force capable of transporting 400 tons one mile per day.

HORTUS SICCUS. Literally, a dry garden; an emphatic appellation given to a collection of specimens of plants, carefully dried and preserved: a more general term is *herbarium.*

HOUR. The twenty-fourth part of a natural day, answering to fifteen degrees of the equator.

1. *Hour, Sidereal.* The sidereal day is four minutes shorter than the mean solar day; it is the actual revolution of the heavens (see *Day*). The astronomer always makes it begin when the vernal equinox is on his own meridian; he divides it into twenty-four *sidereal* hours (each a little shorter than the hour of the common clock) of 60 *sidereal* minutes, of 60 *sidereal* seconds each, and he measures it by a *sidereal* clock, with a pendulum a very little shorter than that of the common clock. He rejects the subdivision into two periods of 12 hours each, and speaks of 15 o'clock, or 16 o'clock, under the phrase 15 *hours* or 16 *hours*, meaning 15 or 16 hours from the commencement of the sidereal day, from the time when the vernal equinox was last on the meridian.

2. *Hour of Angular Measure.* The twenty-fourth part of a revolution which is made in twenty-four hours, and divided in reference to the division of *time.* Thus, an arc of a circle is said to be a certain number of hours, minutes, and seconds, of time; meaning, that the arc in question would be described in that number of hours, minutes, and seconds, if the whole circle were described in twenty-four hours. At this rate, a revolution being divided into 360 equal parts or degrees, 15° make one hour, 15′ one minute of time, 15″ one second of time; also, 1° is four minutes of time, 1′ is four seconds of time, and 1″ is one-fifteenth of a second of time.

3. *Hour-circle.* In Astronomy, the equator is the principal circle employed; it is the circle of progression and regression most commonly used. All secondaries to the equator are called *hour-circles;* or rather, each half of a secondary is an hour *semi*-circle, the two halves of the same secondary belonging to different hours; in fact, a meridian on the earth always answers to an hour-circle in the heavens. Every star is on one hour-circle, and on one only; unless it be at one of the poles of the equator, and then it is on all hour-circles.

4. *Hour-angle.* The hour-angle of a star is the angle which its hour-circle makes with the meridian of the place (represented by the brazen hour-circle when the globe is properly elevated). This hour-angle is nothing when the star is on the meridian, and is an hour of *angular measure* for every *sidereal hour* to or from the time of the transit, being eastward before transit and westward after it.

HUM'BOLDTITE. A rare mineral, consisting of a boro-silicate of iron, and found in chalcedonic geodes in trap rocks in the Tyrol. From this must be distinguished *Humboldtine,* which is a native oxalate of the protoxide of iron.

HU'MITE. A reddish-brown mineral found near Naples in a rock of granular topaz, and named from Sir Abraham Hume.

HUMMOCK. A sheet of ice, which presents a surface generally level, but here and there diversified by projections, arising from the ice having been thrown up by some pressure or force to which it has been subject. (See *Iceberg.*) Also, a term applied by navigators to a circular and elevated mount appearing at a distance.

HUMUS. Vegetable mould; woody fibre in a state of decay. The various names of *ulmin, humic acid, coal of humus*, and *humin*, are applied to modifications of *humus.*

Humic acid of chemists. A product of the decomposition of humus by alkalies; it does not exist in the humus of vegetable physiologists.—*Liebig.*

HURAU'LITE. A new mineral found in the Haute Vienne, consisting of a phosphate of iron and manganese.

HURRICANE. A phenomenon supposed to be of electric origin. A large vacuum is suddenly created in the atmosphere, into which vacuum the surrounding air rushes with immense rapidity, sometimes from opposite points of the compass, spreading frightful devastation along its track.

HY'ACINTH. A sub-species of pyramidal zircon; a red mineral found in volcanic sand in Ceylon, &c.

HY'ADES (ὕω, to rain). The name

of seven stars in the Bull's head, famous among the poets for causing rain.

HY′ALINE (ὕαλος, glass). Of a glassy, thin, and semi-transparent substance. The pellucid substance which determines the spontaneous fission of cells.

HY′ALITE (ὕαλος, glass). A siliceous mineral occurring near Frankfort on the Maine, in fissures in vesicular basalt and basaltic greenstone, and employed by lapidaries for ring-stones.

HYALŒ′IDÆ (ὕαλος, glass). A family of Pteropods in the systems of Cuvier and Lamarck, named from the genus *hyalœa*, which is remarkable for the delicacy and transparency of the shell.

HYBERNA′CULUM. Literally, a place to winter in; a term fancifully applied by Linnæus to the bud of a plant, because it protects the young and tender enclosed parts during the winter.

HYBERNA′TION (*hyberna*, winter-quarters). A reptile state of the functions, which occurs in some animals in winter, as the bat, hedge-hog, dormouse, hamster, &c. Compare *Diurnation*.

HY′BRID (*hybrida*, a mongrel). In Botany, a plant produced by artificial fecundation; *i. e.* by crossing two distinct species of the same genus, or two varieties of the same species. In a few cases, mule plants have been artificially obtained from individuals of different genera.

HY′DATID (ὑδατίς, a vesicle). A term applied to several species of entozoa, or parasitic animals, which have a distinct independent vitality.

HYDR-, HYDRO- (ὕδωρ, water). A Greek prefix generally denoting the presence of *water* in definite proportions; but, owing to the changes of nomenclature, it sometimes denotes the presence of *hydrogen* in certain chemical compounds. In a few of the following terms it relates to the *hydra* or fresh-water polyp:—

1. *Hydra* (ὕδρα, hydra). A fresh-water polyp, common in the ponds and clear waters of our own country, and affording an excellent example of the structure of the *Acrita*, being destitute of any perceptible trace of nervous substance, of muscular fibre, of a vascular system, or of reproductive apparatus.

2. *Hydra* (in Astronomy). The Water-snake; a southern constellation, consisting of sixty stars.

3. *Hydr-acids*. Hydro-acids; a class of acid compounds, into which *hydrogen* enters as the supposed acidifying principle, as the hydro-chloric, the hydro-cyanic, &c. See *Oxacids*.

4. *Hydr-argillite* (ἄργιλλος, clay). Native phosphate of alumina, erroneously supposed to consist of alumina and water.

5. *Hydrates*. Chemical compounds of bases and water, still retaining the solid form, as sulphur, soap, &c. These are also termed *hydr-oxures* and *hydro-oxides*. When there is more than one atom of water, prefixes are employed, as bin-aqueous, ter-hydrate, &c.

6. *Hydr-aulics* (αὐλὸς, a pipe). That branch of Natural Philosophy which investigates the laws by which fluids in motion are regulated, and consequently, the construction of machines in which water is employed as a moving power, or by which that fluid is put in motion.

7. *Hydraulic Press*. An apparatus contrived or applied by Mr. Bramah, for illustrating the hydrostatical law of *the equal pressure of liquids in all directions*. A small quantity of water is driven by sufficient pressure into a vessel *already full*, and provided with a moveable surface or piston of great size. Under such circumstances something must give way; the great surface of the piston accumulates the pressure on it to such an extent that nothing can resist its violence. The apparatus is employed in compressing bodies, in lifting weights, in raising trees from the soil, or piles from the beds of rivers.

8. *Hydraulic Ram*, or *Water Ram*. A hydraulic machine for raising water by means of its own impulse, invented by Mr. Whitchurch, and improved by Montgolfier.

9. *Hydr-iodic acid*. A gaseous compound of hydrogen and iodine, procured by the mutual decomposition of iodide of phosphorus and water.

10. *Hydro-benzamide*. A colourless substance obtained by placing hydrate of benzoïle in a solution of ammonia.

11. *Hydro-branchia* (βράγχια, gills). Under this term Lamarck includes the Nudibranchia, Scutibranchia, and Tectibranchia of Cuvier, together with certain genera, which are arranged in a section. Se *Pneumobranchia*.

12. *Hydro-bromic acid*. A gaseous compound of hydrogen and bromine, obtained by the mutual decomposition of bromide of phosphorus and water.

13. *Hydro-carbon*. A combustible mineral substance found in the interstices of lignite. A compound of hydrogen and carbon: these elements combine in

various proportions, forming a series of compounds commonly termed *hydro-carburets.*

14. *Hydro-chloric acid.* An acid consisting of hydrogen and chlorine, and long known under the names of spirit of salt, marine acid, and muriatic acid. Some chemists term it *chlorhydric* acid.

15. *Hydro-chloric ether.* An ether which has received the various names of chlorhydric, marine, and muriatic ether, and hypothetically, *chloride of ethule.*

16. *Hydro-corisa* (κόρις, a bug). The Water-Bugs; a section of hemipterous insects, characterized by their aquatic habit, and by a peculiar form of the body, which has gained for some of them the popular name of *boat-flies.* See *Geocorisa.*

17. *Hydro-cyanic acid.* An acid consisting of hydrogen and cyanogen, and commonly called prussic acid, from its having been procured, though intermediately, from Prussian blue.

18. *Hydro-dynamics* (δύναμις, power). The mechanics of fluids; or that branch of natural philosophy which investigates the phenomena of equilibrium and motion among fluid bodies, especially such as are heavy and liquid. It is distinguished into *hydrostatics*, which treats of the weight and pressure of liquids; and *hydraulics*, which treats of their motion.

19. *Hydro-electric machine.* A machine constructed by Armstrong on the supposition that electricity is generated when steam is exposed to friction. On the escape of steam from certain cocks provided for that purpose, the pressure being 70 lbs. on the square inch, an effect is obtained 7 times greater than from a good electrical machine with a plate 3 feet in diameter.

20. *Hydro-fluoric acid.* A highly corrosive compound of fluorine and hydrogen, obtained by the action of sulphuric acid upon fluor-spar, or fluoride of calcium, on the application of a moderate heat.

21. *Hydro-gen* (γεννάω, to produce). A gas occurring most generally, and abundantly, in combination with oxygen, in the form of *water.* From its inflammable nature, it was formerly called *inflammable air;* and, from it having been considered the matter of heat, it was called *phlogiston.*

22. *Hydro-graphy* (γράφω, to describe). That branch of Geography which treats of the water or seas, which compose a part of the terraqueous globe. *Hydrographical charts* or *maps* are projections of some portion of the ocean, in which the rhumbs, meridians, parallels, &c. with the coasts, capes, &c. are laid down for the use of navigation.

23. *Hydr-oida* (εἶδος, likeness). An order of the polypipherous Radiata, consisting of animals allied in structure to the *hydra.* They are also called *hydriform* polypes.

24. *Hydro-logy* (λόγος, a description). That branch of natural history which treats of water, of its various properties and modes of existence in nature.

25. *Hydro-mancy* (μαντεία, prophecy). An ancient superstition respecting the *divining* nature of certain springs and fountains; hence, perhaps, arose the discovery of the medicinal virtues of mineral waters.

26. *Hydro-meter* (μέτρον, a measure). An instrument for measuring the gravity of liquids; when floating in a liquid, it rises in proportion as the density of the liquid increases; it is graduated from 1.000 to 1.060, so as to exhibit at once the specific gravity.

27. *Hydro-metridæ.* A family of hemipterous insects, named from the genus *hydrometra,* and adapted for walking on the surface of water.

28. *Hydr-ophidæ* (ὄφις, a snake). Water-snakes; a family of Ophidian reptiles, characterized by the vertical compression of the tail and hinder part of the body, by means of which they are enabled to swim with facility.

29. *Hydro-phane* (φαίνω, to appear). A variety of opal, which is perfectly opaque when dry, but becomes transparent when immersed in pure water. It is also called *oculus mundi.*

30. *Hydro-philidæ* (φιλέω, to love). A family of coleopterous insects, named from the genus *hydrophilus,* and characterized by their aquatic habits.

31. *Hydro-phytes* (φυτὸν, a plant). Plants which grow in water; a name restricted by botanists to algaceous plants found in fresh-water.

32. *Hydro-silicite.* A new mineral found in Serpentine in Siberia, consisting apparently of pure silica and water.

33. *Hydro-statics* (water standing). That branch of mechanics which treats of the weight, pressure, and equilibrium of fluids, when in a state of rest; and of these properties of solids, when immersed in fluids.

34. *Hydro-static balance.* A balance for weighing substances in water, in order to ascertain their specific gravities.

35. *Hydro-static bellows.* An apparatus for illustrating the *hydrostatic paradox,*

or that property of liquids by which they transmit pressure equally in every direction.

36. *Hydro-static paradox.* A term denoting that any quantity of fluid, however small, may be made to balance or counterpoise any quantity, however large.

37. *Hydro-sulphuret.* A compound of sulphuretted hydrogen with a salifiable base.

38. *Hydro-thionic acid* (θεῖον, sulphur). A name given in Germany to sulphuretted hydrogen, or the hydro-sulphuric acid of Gay Lussac.

39. *Hydro-zoa* (ὕδρα, *hydra*, and ζῶον, an animal). Hydriform Polyps; a term applied by Owen to a class of Polyps, which are organized like the hydra, or common fresh-water polype. These correspond with the *Dimorphæa* of Ehrenberg, the *Sertulariens* of Milne Edwards, and the *Nudibrachiata* of Farre.

40. *Hydr-uret*, or *Hydroguret.* A compound of hydrogen with a metal.

41. *Hydrus.* The Water Snake; a modern southern constellation, consisting of ten stars.

HYGRO'METER. (ὑγρὸς, moist, μέτρον, a measure). An instrument for ascertaining the degree of moisture of the atmosphere. The quantity of moisture present in the air is inferred from the reduction of temperature required to produce a deposition of dew from the air; the less the reduction of temperature required, the greater the amount of moisture in the air.

Hygrometric Water. That portion of moisture which gases yield to deliquescent salts.

HY'GROSCOPE (ὑγρὸς, moist, σκοπέω, to examine). An instrument for indicating the presence of aqueous vapour in the atmosphere, without measuring the amount. *Hygroscopic substances* are mostly of animal or vegetable origin, as hair, fish-bone, animal membranes, the beard of the wild oat, &c.

HYLÆ'OSAURUS (ὑλαῖος, of the wood, σαῦρος, a lizard). An extinct gigantic land reptile, of the Wealden strata of Kent and Sussex, forming, with the megalosaurus and iguanodon, a natural and well-marked group of colossal animals, connected with the middle secondary period.

HYLO'BATES (ὑλοβάτης, one who haunts the wood). The name given by Illiger to the long-armed Apes or Gibbons, which haunt the forests, and resemble the Orangs in form and dentition.

HYME'NIUM (ὑμὴν, a membrane). That part of a fungaceous plant in which the sporules immediately lie: in agaricus it consists of parallel plates, called *lamellæ*, or gills.

HYMENO'PTERA (ὑμὴν, a membrane, πτέρον, a wing). An order of mandibulate insects, which have four membranous, naked, and unequal wings, and undergo complete metamorphosis, as the wasp. They are distinguished by Latreille into the *terebrantia*, in which the abdomen of the females is furnished with a saw or borer; and the *aculeata*, in which the abdomen of the females is armed with a sting.

HYPER (ὑπὲρ, over or above). A Greek preposition, denoting a position *above*, or *excess*. In chemical nomenclature, it denotes that the acids to which it is prefixed contain *more* oxygen than those to which the word *per* is prefixed, as hyper-chloric acid. It corresponds with the Latin preposition *super*.

HYPE'RBOLA (ὑπερβολὴ, a throwing beyond). A section of a cone by a plane, which, if extended, would cut the opposite cone, so that the sections of both cones will exhibit curves expanding continually, like the parabola, but with different properties. This conic section is called a *hyperbola*, because the angle which its plane forms with the base of the cone *is greater than* that of the parabola.

Hyperbol-oid (εἶδος, likeness). A geometrical solid, formed by the motion of a hyperbola round its axis. It is also termed a *hyperbolic conoid.*

HY'PERSTHENE. *Labrador hornblende.* A variety of *augite*, of a greenish-black colour, very similar in its general appearances and characters to diallage. It consists of silica, oxide of iron, magnesia, and alumina.

Hypersthene Rock. A compound of hypersthene and felspar, the latter being compact, crystalline, or glassy. These form three varieties, to which M'Cullock has given the general name of hypersthene rock.

HYPHA (ὑφὴ, a web). A term applied by Willdenow to the filamentous, fleshy, watery thallus of byssaceæ.

HYP-, HYPO- (ὑπὸ, under). A Greek preposition, signifying a position *under*, or *deficiency*. In chemical nomenclature it denotes the presence of a smaller quantity of acid than is found in the compounds to which it is prefixed. It corresponds, in all these applications, to the Latin preposition *sub*:—

1. *Hyp-allage* (ὑπαλλαγὴ, an interchange). A figure of speech, by which the parts of a proposition seem to be interchanged, or two words mutually exchange their respective cases, as "dare *classibus austros*," for dare *classes austris*. This figure has little place in correct prose, but is an allowable resource for poets.

2. *Hyp-anthodium*. A term applied by Link to the receptacle of plants when it is fleshy, and not enclosed within an involucrum, as in dorstenia and ficus. See *Anthodium*.

3. *Hypo-blastus* (βλαστὸς, a shoot). A term applied by Richard to the scutelliform cotyledon of grasses, which he considers to be a particular modification of the radicle.

4. *Hypo-crateriform* (*cratera*, a salver, *forma*, likeness). Salver-shaped; as applied to a calyx or corolla, of which the tube is long and slender, and the limb flat, as in phlox. The term is at once unwieldy and unclassical: *sub-crateriform* or *hypo-crateroïd* would be classical, but either is unwieldy.

5. *Hypo-gene Rocks* (γίνομαι, to be produced). Those rocks which are *nether-formed*, or which have not assumed their present form and structure at the surface, as granite, gneiss, &c. This term, which includes both the plutonic and metamorphic rocks, is substituted for *primary*, because some members of both these classes, as granite and gneiss, are posterior to many secondary or fossiliferous rocks.

6. *Hypo-geous* (γῆ, the earth). Subterranean; as applied to those cotyledons which remain beneath the earth after germination, and as opposed to *epigeous*.

7. *Hypo-gynous* (γυνὴ, a woman). That condition of the stamens of a plant in which they contract no adhesion to the sides of the calyx, as in ranunculus.

8. *Hypo-nitrous Acid.* The name given by Turner to nitrous acid, or the azotous of Thenard; while *hypo-nitric acid* is the nitrous acid of Turner, or the peroxide of nitrogen.

9. *Hypo-phyllum* (φύλλον, a leaf). A term applied by Link to a petiole which has the form of a small sheath, is destitute of blade, and surrounds the base of certain small branches having the appearance of leaves, as in asparagus.

10. *Hypo-stasis* (ὑπόστασις, strictly, *a standing under;* essence, substance). A term expressing "that which stands under (*i. e.* is the subject of) attributes." It is worth observing, as a striking instance of the little reliance to be placed on *etymology* as a guide to the meaning of a word, that "Hypostasis," "Substantive," and "Understanding," so widely different in their sense, correspond in their etymology.

11. *Hypo-stasis* (in Botany). The name given by Dutrochet to the *suspensor*, or delicate thread which descends from the summit of the ovule into the quintine, and bears at its extremity a globule, which is the nascent embryo.

12. *Hypo-tenuse* (ὑποτείνω, to extend under). That side of a right-angled triangle which is opposite to the right angle. Of the other two sides, one is frequently termed the *base*, and the other the *perpendicular*.

13. *Hypo-thecium* (θήκη, a hollow case). The substance which surrounds or overlies the perithecium of lichens, as in cladonia.

14. *Hypo-thesis* (ὑποτίθημι, to suppose). A supposition, or doctrine, founded on theory. The term is used synonymously with *system*, but, further, conveys the uncertainty which attaches to a system.

15. *Hypothetical Proposition.* In Logic, a proposition which asserts, not absolutely, but under a hypothesis, indicated by a conjunction. A hypothetical proposition, called by some writers *compound*, is defined to be *two or more categoricals united by a copula* (or conjunction); and the different kinds of hypothetical propositions are named from their respective conjunctions, *viz.*, conditional, disjunctive, causal, &c. A *hypothetical syllogism* is one of which the reasoning depends on such a proposition. —*Whately.*

16. *Hypo-zoic System* (ζῶον, an animal). A geological term, applied by Phillips to those rocks of crystalline slates which occur especially in the central ridges of mountain chains. The term implies that they contain no organic remains, and that they are geologically below all the rocks which do contain traces of animal life. See *Metamorphic.*

HYSTERA′NTHOUS (ὕστερον, afterwards, ἄνθος, a flower). A term applied, in Botany, to those plants in which the leaves appear after the flowers, as in almond.

HYSTRI′CIDÆ (ὕστριξ vel ὕσθριξ, having hog's bristles; from ὗς, a hog, and θρὶξ, hair). The Porcupine tribe; a family of the *Rodentia*, characterized by the stiff and pointed quills with which they are armed, resembling those of the hedge-*hog*, though usually larger. The term porcupine is a corruption of the French *porc-epin*, or hog's-spine; besides, the general appearance and peculiar grunt of the porcupine are not unlike those of the hog.

I

IA'NTHINÆ. Oceanic shells; a subfamily of the *Turbidæ*, named from the genus *ianthina*, comprising those fragile violet and white snails which so much resemble the *Helicidæ*. The animal is of peculiar structure.

ICE, POLAR. The poles are probably surrounded by a continuous expanse of ice, the borders of which have been explored by navigators, and designated by various appellations, in reference to the form and extent of its masses:—

1. An *Ice-berg*, or ice-hill, is a vast isolated mass of ice, sometimes rising to the height of 100, and even 200, feet above the surface, and extending beneath it to a much greater depth. Ice-bergs are formed by glaciers, which, sometimes terminating a precipitous edge on the coast, and being gradually protruded, at length break off, and fall into the sea.

2. A *Field of Ice* is a continued sheet of ice, so large that its boundaries cannot be seen from the mast-head of a vessel; it has sometimes an area of more than 100 square yards, and rises above the level of the sea from two to eight feet. Ice-fields are generated in the open sea, and are almost constantly driving in summer, their general motion being south-westward. They acquire occasionally a rotatory motion, when their circumference attains a velocity of several miles an hour.

3. A *Pack of Ice* consists of pieces of ice broken off from a field, when driven to the southward, and exposed to the effects of a ground swell; these pieces are about forty or fifty yards in diameter, and extend so widely as not to be seen over from the mast-head.

4. A *Patch of Ice* is a collection of pieces of ice, which assume a circular form. When the collection is of an elongated form, it is called a *stream*. Pieces of very large dimensions, but smaller than fields, are called *floes*. Small pieces broken from larger masses by attrition, are called *brash-ice*.

5. A *Hummock of Ice* is a protuberance raised upon any plane of ice above the common level. A *calf* of ice is a portion extending below the surface of the water.

ICE-SPAR. A sub-species of prismatic felspar, of vitreous lustre, translucent and transparent, found at Monte Somma near Naples.

ICELAND-SPAR. One of the purest varieties of calcareous spar, or crystallized carbonate of lime. It is not, however, peculiar to Iceland. Of all crystallized bodies, this exhibits most readily the phenomenon of double refraction.

ICHNEUMO'NIDÆ. A family of the entomophagous *Terebrantia*, named from the typical genus *ichneumon*, and characterized by their habit of depositing their eggs in the bodies of other insects, on which the young feed, when hatched.

ICHTHYODO'RULITES (ἰχθὺς, a fish, δόρυ, a spear, λίθος, a stone). Fossil spear-like projections from the back and belly of a shark-like fish, supporting fins, and serving probably also as weapons. They occur in the carboniferous strata, and seem to be identical with the bony spine with which the Port Jackson shark is provided.

ICHTHYO'LOGY (ἰχθὺς, a fish, λόγος, a description). That branch of zoology which treats of *Fishes*, a class of animals occupying the lowest station of the four great divisions of the section Vertebrata. They are distinguished by Cuvier, with reference to their skeleton, into the Osseous and the Cartilaginous.

1. *Osseous Fishes* are those which have a bony skeleton, the bony matter being disposed in fibres; the sutures of the cranium are distinct; the maxillary and the intermaxillary bones are, either one or both, present. The *sections* are the Pectinibranchii, the Plectognathi, and the Lophobranchii. The first of these comprises the *orders* Acanthopterygii, Malacopterygii, and Apodes.

2. *Cartilaginous Fishes* (chondropterygii) are those which have a cartilaginous skeleton, the bones being destitute of fibres; the sutures of the cranium are

indistinct; the maxillary and the intermaxillary bones are either wanting or rudimentary, their place being supplied by the palatine or vomer. The *orders* are the Eleutheropomi, Plagiostomi, and Cyclostomi.

ICHTHYOPHTHA'LMITE (ἰχθὺς, a fish, ὄφθαλμος, an eye). Fish-eye stone; a species of zeolite, with a pearly lustre, resembling the eye of a fish. See *Apophyllite.*

ICHTHYOSAU'RUS (ἰχθὺς, a fish, σαῦρος, a lizard). A gigantic fossil marine reptile, intermediate in its characters between a crocodile and a fish, occurring in the lias formation. It differs from any known reptile of the present day, in the substitution of paddles for feet.

I'COSAHE'DRON (εἴκοσι, twenty, ἕδρα, a seat). In Geometry, a solid figure bounded by twenty equal and equilateral triangles.

ICOSA'NDRIA (εἴκοσι, twenty, ἀνὴρ, a man). The twelfth *class* of plants in the system of Linnæus, characterized by the presence of twenty or more stamens *inserted into the calyx.*

IDEA (ἰδέα, form). In its widest acceptation, this term denotes an impression of an external object upon the senses, or of an object of thought upon the mind. In the Platonic philosophy the ἰδέαι, or "Ideas," were not only εἴδη, or species, but something more, viz. the perfect *archetypes*, models or patterns, of which, respectively, all created things were the imperfect *anti-types* or representations; εἶδος might therefore be used for ἰδέα, but not ἰδέα for εἶδος.

IDE'AL THEORY. A scholastic theory, which refers all perception to the impression on the mind of certain *ideas* or images of external objects, the organs of sense having no percipient power themselves, but merely transmitting the ideas of these objects to the mind.

IDE'NTICAL (*idem*, the same). 1. In its primary and proper sense, this term denotes *oneness* or *sameness*, and is applicable only to a *single* object. 2. In its secondary and improper sense, it is employed to denote great *similarity*, as when two guineas, struck from a wedge of uniform fineness, are said to be "of one and the same form and weight, and also of one and the same substance." Yet they are not identical, but *numerically* distinct. Further, in this secondary sense, the term popularly admits of *degrees:* we speak of two things being *nearly* identical, *nearly* the same, but not entirely; whereas personal identity does not admit of degrees.—*Whately.*

IDEOGRA'PHIC WRITING (ἰδέα, an idea, γράφω, to write). A kind of writing by which objects or abstract *ideas* are symbolically represented, as in the figurative part of the Egyptian hieroglyphics. It is opposed to *phonetic* writing, in which the symbols employed represent *sounds.*

IDEO'LOGY (ἰδέα, an idea, λόγος, a description). By this term the later disciples of Condillac have designated the *science of ideas*, or the history and evolution of human ideas, considered as successive modes of certain original or transformed sensations.

IDIOSY'NCRASY (ἴδιος, peculiar, σύγκρασις, composition). Individual peculiarities, hereditary or induced. Thus, there are persons in whom opium does not induce sleep; others, in whom milk seems to act as a poison.

I'DOCRASE (εἶδος, form, κρᾶσις, mixture). A designation of Vesuvian or Pyramidal Garnet, from the *mixed forms* of other minerals which it presents. It is an alumino-silicate of lime, with a portion of oxide of iron.

I'DOLS (εἴδωλον, an image). By this fanciful term Lord Bacon points out the various general sources of those *errors* which we are apt to commit in forming our notions of things. These *idols*, or false notions of the mind, are divided into four classes, *viz.* :—

1. *Idols of the Tribe;* so called because they are common to the whole *tribe* or race of mankind, being, in fact, those general prejudices which arise from the infirmity of human nature itself. "The understanding of man is like a mirror whose surface is not true, and so, mixing its own imperfection with the nature of things, distorts and perverts them."

2. *Idols of the Cave or Den;* or "each man's particular demon, or seducing familiar spirit;" or, less figuratively, those prejudices which stamp upon each mind its own peculiar character, and are identified with every individual man. Every mind is compared to "a glass, with its surface differently cut, so as differently to receive, reflect, and refract, the rays of light which fall upon it."

3. *Idols of the Market-place;* or prejudices arising from mere words and terms in our common intercourse with mankind; these proceed, in short, from the imperfection of language, and are "the most troublesome of all." *Defini-*

tions themselves cannot wholly remedy the evil; for "definitions consist of words, and words produce words; so that recourse must be had to particular instances."

4. *Idols of the Theatre;* or the prejudices and perversions of the mind arising from fabulous and visionary theories and romantic philosophies. They are thus named, "because all the systems of philosophy which have been hitherto invented, or received, are but so many *stage-plays* which have exhibited nothing but fictitious and theatrical worlds; and there may still be invented and dressed up numberless other fables of the same kind."

I'DRIALINE. A substance obtained from a mineral from the quicksilver mines at Idria in Carniola. It consists of carbon and hydrogen.

IGASURIC ACID. The name given by Pelletier and Caventou to a peculiar acid, which occurs in combination with strychnia in nux vomica, and the St. Ignatius's bean; but its existence, as different from all other known acids, is doubtful. It is so called from the Malay name by which the natives in India designate the *faba Sancti Ignatii.*

I'GNEOUS ROCKS (*ignis*, fire). A term applied to all rocks, as lava, trap, and granite, which are known or supposed to have been melted by volcanic heat.

IGNIS FATUUS. A luminous appearance or flame, frequently seen in the night in the country, and called *Jack o' lantern*, or *Will with the wisp.* It is probably occasioned by the extrication of phosphorus from rotting leaves and other vegetable matters.

IGNITION (*ignis*, fire). The emission of light from a heated body, unattended by change of composition. Bodies begin to become *ignited*, or red-hot, at about 800° Fahr.; the highest point of ignition consists in the emission of a perfectly *white light.*

I'GREUSINE. *Elaïodon.* That portion of volatile oils which is odoriferous, and is coloured by treating it with nitric acid.

IGUA'NIDÆ. A family of saurian reptiles, including some of the largest of this tribe, both recent and fossil. They agree with the lizards in general form, but differ in the shortness and thickness of their tongues. See *Iguanodon.*

IGUA'NODON (*iguana*, a recent West Indian lizard, ὀδοὺς, a tooth). A gigantic fossil saurian, exceeding eighty feet in length, occurring in the Wealden formation, and known to us by the teeth and a considerable part of the skeleton. Its name is derived from the resemblance of its teeth to those of the iguana.

I'LLATIVE CONVERSION. In Logic, a mode of conversion in which the truth of the converse follows from the truth of the exposita, or proposition given. Conversion can then only be illative, when no term is distributed in the converse, which was not distributed in the exposita. Illative conversion is not a process of *reasoning;* it is only stating the *same* judgment in another form. See *Conversion.*

ILLUMINA'TION (*illumino*, to throw light upon). The process of rendering a body visible by light: every object exposed to the sun is illuminated; a lamp illuminates a room and every object in it.

IMAGE. The appearance of an object made either by reflection or refraction. In all plane mirrors, the image is of the same magnitude as the object, and it appears as far behind the mirror as the object is before it. In concave mirrors the image appears larger, and in those which are convex it appears less, than the object.

Image, Aerial. When an object is placed at a greater than its focal distance from a convex lens, it produces on the opposite side of the glass an inverted image floating in the air; hence called an *aerial image.*

IMA'GINARY QUANTITIES. In Algebra, this term is applied to the *even* roots of *negative* quantities, as $\sqrt{-x^3}$. Such expressions indicate operations which are impossible, and hence they are also called *impossible quantities.* The difference between surd and impossible quantities is, that the former have *real* values, though we cannot exactly find them, while there *cannot* be a quantity, positive or negative, an even power of which would produce a negative quantity.

IMA'GO. A term applied to the third and perfect state of insect existence, in which, the skin of the pupa having burst, the animal escapes, furnished with wings adapted for flight.

IMBIBI'TION (*imbibo*, to drink in). The terms *imbibition*, and *exudation* or *transpiration*, used in Physiology, are analogous to those of *aspiration* and *expiration*, and have been lately translated, by Dutrochet, by the two Greek words *endosmosis* and *exosmosis.*

I'MBRICATED (*imbrex*, a roof-tile). A designation of that form of æstivation, or vernation, in which the pieces of the bud overlap each other parallelly at the margins, without any involution. The term is particularly applicable to the bracts of glumaceous plants.

IMMER'SION (*immergo*, to plunge into). An astronomical term, denoting the disappearance of any celestial body behind another or in its shadow, as in the eclipses of Jupiter's satellites. The re-appearance of the body, after occultation, is termed its *emersion.*

I'MPACT (*impingo*, to impinge). By Impact or Percussion is meant the collision of two bodies, of which one at least is in motion. The impact is said to be *central*, when the directions of the centres of gravity of the two solid bodies are in a right line; *eccentric*, when this is not the case; *direct* or *perpendicular*, when the direction of the moving body is at right angles to the side of the body impinged on; *oblique*, when this is not the case.

I'MPARI-PINNATE. A term applied, in Botany, to that mode of the composition of leaves, in which they are pinnate with an odd one, as when the petiole of a pinnate leaf is terminated by a single leaflet, as in mountain-ash.

IMPE'NETRABI'LITY (*in*, not, *penetro*, to penetrate). That property by which a body occupies any space, to the exclusion of every other body. In a popular sense, all matter is *penetrable;* but, philosophically speaking, it is *impenetrable*, what is called penetration being merely the admission of one substance into the *pores* of another. A nail driven into a board or piece of lead, does not penetrate the wood or metal; it merely *separates* or displaces the particles of these substances.

IMPE'RATIVE MOOD (*impero*, to command). That mood of the verb which commands an action to be performed, or a state to exist.

IMPO'NDERABLES (*in*, priv., *pondus*, weight). Agents which are destitute of weight, as heat, light, and electricity. These are supposed to be of so subtile a nature as to pass through all material bodies, by which, therefore, they cannot be either enclosed or divided.

IMPOSSIBILITY. This term is used in three different senses:—

1. A *mathematical* impossibility is that which involves an absurdity and self-contradiction, as that two straight lines should enclose a space. No limitation of *power* is here implied; it is, in reality, *nothing* that is required to be done.

2. A *physical* impossibility is something at variance with the existing laws of nature, and which, consequently, no being, subject to those laws, can surmount; but we can easily conceive a Being capable of bringing about what in the ordinary course of nature is impossible. An occurrence of this character we call *miraculous.*

3. A *moral* impossibility is that high degree of improbability which leaves no room for doubt. This implies no contradiction, nor any violation of the laws of nature, but which yet we are rationally convinced will never occur, merely from the multitude of chances against it; as that unloaded dice should turn up the same faces one hundred times successively. And yet why should they not? since the chances are the very same against *any* given one hundred throws.—*Whately.*

IMPOSSIBLE. In Logic, the *matter* of a proposition is said to be *impossible*, when the extremes altogether disagree. The proposition is then equivalent to a universal. Thus, *brutes neither eat nor drink more than nature requires;* that is, no *brutes, &c.*

An *impossible quantity*, in Algebra, is the same as an imaginary quantity. See the latter term.

I'MPULSE (*impulsus*, a push or stroke). The direct action of one body upon another in the production of motion. Bodies are *impelled*, or driven forward, either by *percussion* or by *pressure*—by a *stroke*, as by a hammer, or by a *push*, as by a spring or living power. The former is instantaneous, the latter continuous. In both cases the moving body flies *from* the power; in the action of pulling, or attraction, it does the reverse.

INCANDE'SCENCE (*incandesco*, to become white-hot). The glowing or shining appearance of heated bodies; properly, the acquisition of a white heat.

INCEPTIVE (*incipio*, to begin). That which begins any thing; a term sometimes applied to a *moment* or principle, from which, as from a starting-point, something may be extended; thus a *point* or a *line*, in mathematics, though possessing no magnitude, is said to be *inceptive* of enlargement. But this is a verbal fallacy; for that which has no parts, cannot be enlarged.

I'NCIDENCE (*incido*, to fall upon). The direction in which one body strikes on another. The term is used in different senses by writers on mechanics and writers on optics. See *Angle of Incidence*, in each case.

INCINERA'TION (*incinero*, to reduce to ashes, from *cinis*, a cinder). The reducing to ashes by burning. The combustion of vegetable or animal substances for the purpose of obtaining their ashes or fixed residue.

INCI'SION (*incido*, to cut). This term must be distinguished from the *cæsura* of metre. Incision is the coincidence of the end of the foot with the end of the word; it is essential in some species of verse, and is used also in the hexameter under certain forms.

INCLINATION. In mathematics, the mutual approach of two lines, or planes, towards each other, so as to make an angle. The *inclination of the orbit* of a planet is the angle which the plane of the planet's orbit makes with the ecliptic, or the earth's orbit. The *inclination*, or dip of the magnetic needle is the angle which such needle, when supported on its centre of gravity, makes with the plane of the horizon.

INCLINED PLANE. One of the five simple mechanical powers, consisting of a plain smooth surface, which is inclined towards or from the earth. A board, with one end on the ground, and the other end resting on a block, becomes an inclined plane.

INCLU'SA (*includo*, to enclose). An order of the conchiferous acephalous mollusca, in which the mantle has only one opening for the passage of the foot; at the posterior end it is prolonged into tubes of great length, which can be extended far beyond the shell, as in the common *solens* or razor-shells.

INCOMBUSTIBLE CLOTH. A cloth manufactured of the fibres of asbestos; on burning away the fibre, the mineral texture remains.

INCOMME'NSURABLES. Any two magnitudes which cannot be represented by means of the same unit, and cannot consequently have any common measure, are said to be *incommensurable*, as the diagonal and the side of a square. Numbers are said to be *incommensurable in power*, when their squares or second powers are incommensurable, as 2 and 3, the squares of which, 4 and 9, have no common measure.

INCOMPATIBLES, CHEMICAL. A term applied to salts or other compounds, which cannot exist together in solution, without mutual decomposition, as the salts of barytes and those which contain sulphuric acid.

INCOMPRESSIBILITY. That property of a substance, whether solid or fluid, by which it resists being pressed or squeezed into a smaller bulk. The ultimate particles of all bodies are supposed to be incompressible.

I'NCREMENTS, METHOD OF. A method of analysis, more commonly called the *calculus of finite differences.* In the higher mathematics, the terms *increment* and *decrement* are employed, when two quantities are considered together, one of which is greater or less than the other; the latter is then said to be the former with an increment or decrement.

INCU'MBENT (*incumbo*, to lie upon). That which lies upon any thing; a term applied, in Botany, to the cotyledons of those cruciferous plants, which are folded with their backs upon the radicle. See *Accumbent.*

INDE'FINITE. In Geometry, this term is applied to a straight line, which may be produced to any length in a given direction, without affecting the conditions of the problem. The term is sometimes used in the sense of *infinite*, as when we hear of a magnitude being indefinitely great, an indefinitely small arc being equal to its chord, a circle being a polygon of an indefinitely great number of sides, &c.

INDE'FINITE PROPOSITION. In Logic, a proposition which has for its subject a common term without any sign to indicate distribution or non-distribution. In these cases, the quantity of a proposition is ascertained by the *matter*, or the nature of the connexion between the extremes: in necessary and in impossible matter, an indefinite is *understood as a universal;* in contingent matter, *as a particular.*

INDE'FINITE TERM. In Logic, a privative or negative term is called *indefinite*, in respect of its not defining or marking out an object; and it is opposed to a *definite* or positive term, which does define or mark out. Thus, "organized being" is a definite, "unorganized being" an indefinite term.

INDEHI'SCENT (*in*, not, *dehisco*, to

gape). A term applied, in Botany, to the state of those fruits in which the pericarp, when arrived at maturity, continues perfectly closed, as in the hazel nut. See *Dehiscence.*

INDE'NTED. A term applied to any part of a body which is depressed or sunk beneath the surrounding surface, whether the indentations consist of lines, dots, irregular cavities, or tooth-like depressions.

INDEPENDENT COAL FORMATION. By this term Werner designated the first or oldest formation, because the individual depositions of which it is composed are independent of, and unconnected with, one another. It contains exclusively coarse coal, foliated coal, cannel coal, slate coal, a kind of pitch coal, and slaty glance coal.

INDESTRUCTIBI'LITY. That property of matter by virtue of which it never ceases to exist: it may change its form, and disappear; but it is not annihilated. In what is called *destructive* distillation, the matters subjected to the operation are evidently indestructible; for the products, when collected and weighed, are found to be exactly as heavy as the original matters.

INDETE'RMINATE. 1. In Mathematics, a problem is said to be indeterminate, when it admits of an infinite number of solutions. 2. In Algebra, the co-efficients of an assumed form of expansion are said to be indeterminate, and the process by which they are then found, is called the "method of indeterminate co-efficients." 3. If *one* equation contain *two* unknown quantities, the number of values of these by which it will be satisfied, is *unlimited*, and the equation is said to be indeterminate.

INDEX (*indico*, to point out). 1. In Algebra, a small figure placed at the right of a quantity, to signify its power (See *Exponent*). 2. The index of a logarithm, or its *characteristic*, is the figure prefixed to the logarithm for the purpose of indicating the unit's place in the corresponding number. 3. In optics, the *index of refraction* is the constant ratio which exists between the sines of the angles of incidence and refraction.

I'NDIANITE. A whitish or greyish mineral, consisting of silica, alumina, lime, iron, and manganese, occurring in masses in the Carnatic, where it constitutes the gangue of corundum.

INDI'CATIVE MOOD (*indico*, to point out). In Grammar, that condition of the verb which declares the action or state to exist simply and as a fact.

INDI'CTION. In Chronology, a revolution of fifteen years, as already noticed under the term *Era.* Its origin has not been ascertained; but Gibbon observes, that the name and use of the "Indictions" were derived from the Roman tributes. There are four descriptions of Indictions:—

1. The Indiction of *Constantinople*, which was instituted by Constantine in A. D. 312, and began on the 1st of September.

2. The *Imperial* or *Cæsarean* Indiction, which began on the 24th of September.

3. The *Roman* or *Pontifical* Indiction, which commences on the 25th of December or 1st of January, according as either of these days was considered as the first of the year. This was generally used in papal bulls, at least from the ninth to the fourteenth century.

4. The fourth kind of Indiction, which is to be found in the register of the parliaments of Paris, began in the month of October.

INDI'FFERENCE. This term, in its application in respect of the *will* and of the *judgment*, is subject to an ambiguity which may perhaps be thought hardly worth noticing, the distinction between *unbiassed candour* and impartiality on the one side, and *carelessness* on the other, being so very obvious. Yet, under the same name, these things are confounded; and, in fact, the judgment is often, though by no means always, biassed by the will. Our aim should be to preserve the indifference of the *judgment*, even where the *will* neither *can* nor *should* be indifferent.—*Whately.*

INDI'GENOUS (*indigena*, a native). A term applied to animals or plants peculiar to a certain country.

INDIGO. A blue pigment, obtained from the leaves of all the species of *Indigofera*, and various other plants. *White indigo*, also called *reduced indigo*, is procured by the action of deoxidizing bodies upon blue indigo; in this state, Liebig termed it *indigogen.*

I'NDIGOLITE. An indigo-coloured crystallized mineral, found at Utoe in Sweden, and considered to be a variety of tourmaline.

INDIGO'TIC ACID. *Anilic Acid.* An acid formed when indigo is dissolved in nitric acid considerably diluted. This is the *nitranilic acid* of Berzelius.

INDIVI'DUAL (*individuus*, that cannot be divided). An object which is, in the strict and primary sense, One, and, consequently, cannot be *logically divided;* which is a metaphorical expression to signify "the distinct (*i. e.* separate) enumeration of several things signified by one common name." This operation is directly opposite to *generalization*, which is performed by means of abstraction; for as, in that, we *lay aside the differences* by which several things are distinguished, so as to call them all by one *common name*, so, in Division, we *add on the differences*, so as to enumerate them by their *several particular* names. Thus "mineral" is said to be divided into "stones," "metals," &c.; and metals again into "gold," "iron," &c.; and these are called the parts, or members of the division.—*Whately.*

INDIVI'SIBLES, METHOD OF. A method formerly employed in Algebra, founded on the assumption that quantities are composed of infinitely small quantities incapable of further division. It was a kind of *atomic* theory, by which lines were considered as made up of an infinite number of points, surfaces of an infinite number of lines, and solids of an infinite number of surfaces. The method has been entirely superseded by the differential and integral calculus.

INDU'CTION (*induco*, to bring in, to infer). A kind of argument which infers, respecting a whole class, what has been ascertained respecting one or more individuals of that class. Induction, so far as it is an *argument*, may, of course, be stated syllogistically; but so far as it is a *process of inquiry* with a view to obtain the premises of that argument, it is, of course, out of the province of logic; and the latter is the original and strict sense of the word.—*Whately.*

INDU'CTION (in Electricity). The law by which an electrified body *induces*, or tends to produce, in contiguous substances an electric state opposite to its own.

INDU'CTIVE SCIENCE. A science which ascends from particular facts to general principles, and descends from these general principles to particular applications. Induction is the opposite of *hypothesis*, which consists in laying down a theory at the outset of an inquiry, and trusting to future experiments, or example, for its proof.

INDUCTOMETER, DIFFERENTIAL. An instrument, so named by Faraday, consisting of three insulated metallic plates, placed parallel to, and at equal distances from, one another, each exterior plate being connected with an insulated gold-leaf of an electrometer.

INDUS. The Indian; a modern southern constellation, consisting of twelve stars, situated between Sagittarius and the South Pole.

INDU'SIAL LIMESTONE. A freshwater limestone, abounding in the indusiæ of the larva of *phrygania*, encrusted by hard travertin and converted into rock.

INDU'SIUM (*induo*, to put on). A term applied, in Botany, to that portion of the epidermis of ferns which covers the sori; also, to the peculiar form assumed by the hairs of the style in certain plants, when they are united into a cup, enclosing the stigma, as in Goodeniaceæ.

INDU'VIÆ (*induviæ*, clothes). In Botany, this term denotes the withered remains of leaves, which, not being articulated with the stem, do not fall off, but decay with it. A part so covered is said to be *induviate.*

INE'NCHYMA. A term applied by Morren to the fibro-cellular tissue of plants.

INEQUA'LITY. 1. In Algebra, if one quantity be greater or less than another, or than nothing, and this be expressed algebraically, it is called an *inequality*. Thus $x-a>b-x$ is an inequality, of which $x-a$ forms one *side*, and $b-x$ the other. 2. In Astronomy, the term denotes any deviation in the motion of a planet or satellite from its uniform mean motion.

INE'RTIA (*iners*, inactive). That property of matter by which it would always continue in the same state of rest or motion in which it was put, unless changed by some external force. The quantity of matter of a body is determined by its *quantity of inertia;* and this is estimated by the quantity of force required to put it in motion at a given rate.

IN ESSE; IN POSSE. The former of these Latin terms is applied to things which do actually exist; the latter, to things which do not, but may, actually exist.

INFERENCE AND PROOF. "Reasoning comprehends *Inferring* and *Proving;* which are not two different things, but the same thing regarded in *two different points of view:* like the road from London to York, and the road from York to London. He who infers, proves; and he who proves, infers; but the word 'infer' fixes the mind *first* on the premiss and then on the *conclusion;* the word 'prove,' on the contrary, leads the mind *from* the conclusion *to* the premiss. Hence, the substantives derived from these words respectively, are often used to express that which, on each occasion, is *last* in the mind; *Inference* being often used to signify the *conclusion* (*i. e.*, proposition inferred), and *Proof*, the premiss. To *infer*, is the business of the *philosopher;* to *prove*, of the *advocate*."—*Whately.*

INFERIOR FRUIT. In Botanical language, a fruit or ovary is termed *inferior*, when the calyx adheres to its walls; when no such adhesion occurs, the fruit or ovarium is said to be *superior*. So, also, the calyx is called *superior* in the former case, and *inferior* in the latter. French botanists employ in the same sense, and with much greater precision, the terms *adherent* and *non-adherent.*

INFERIOR VALVE. That valve of adherent bivalves by which they are united to other substances.

I'NFERO-BRANCHIA'TA (*inferus*, beneath, *branchiæ*, gills). An order of Aquatic Gasteropods, in which the branchiæ resemble two long rows of leaflets, placed on the two sides of the body, under a projecting edge formed by the mantle. Cuvier records two genera, viz. *phyllidia* and *diphyllidia.*

IN'FIMA SPECIES. In Logic, the lowest species, or that which is not subdivided, except into individuals. See *Species.*

I'NFINITE (*infinitus*, boundless). In Geometry, an infinite quantity is that which is greater than any assignable magnitude; in other words, it is an abstraction of the mind, formed by excluding the idea of limitation. On the same principle, an *infinitely small quantity* is a quantity considered as less than any assignable magnitude. Such a quantity is called an *infinitesimal*, and the employment of such quantities as auxiliaries, in investigating the relations of proposed quantities, is called the *infinitesimal analysis.*

INFI'NITIVE MOOD (*infinitus*, undefined). In Grammar, that condition of the verb which expresses the state of an action, as in progress or completed, but without specification of person, number, or time.

INFLAMMABLE AIR. Hydrogen gas, named from its highly inflammable nature. It was formerly called *phlogiston*, from its having been considered the matter of heat.

INFLE'XION (*inflecto*, to bend in). In Grammar, any change made in a word in order to modify its meaning is called its *accident* or *inflexion*. Thus, the words *Cæsar's*, *legions*, *were*, *feared*, are said to be inflected forms, or, simply, inflexions of the words Cæsar, legion, was, and fear. Inflexion must not be confounded with termination; it denotes any change which takes place in a word between the *root* and the *termination.*

INFLEXION OF WAVES. If a circular wave of a non-elastic fluid impinge on a solid in which there is an aperture, that part of the wave which comes against the aperture will pass freely through, while the other part, which strikes against the solid, will be curved about the edges of the aperture, so that one semicircle will be in front of the aperture, and the other beyond it. This is the *inflexion of waves*. The new circular waves formed about the aperture will intersect the original wave and each other, so that *interference* points and lines will be produced. Similar phenomena occur in *waves of sound.*

INFLORE'SCENCE (*infloresco*, to flourish). A term expressing, generally, the arrangement of flowers upon a branch or stem. The various forms of centripetal inflorescence, which have received distinct appellations, are usually referred to modifications of the *spike* and of the *raceme*. The centrifugal inflorescence is represented by the *cyme.*

INFORMED STARS. Stars which are not included in any of the constellations.

INFUNDIBU'LIFORM (*infundibulum*, a funnel, *forma*, likeness). Funnel-shaped; a term applied to an organ which has an obconical tube and an enlarged limb, as the corolla of tobacco.

INFUSO'RIA (*infundo*, to pour in). Water animalcules; microscopic animals found in infusions of animal and vegetable matter. They are distinguished into the *Polygastrica* and the *Rotifera.*

IN'GRESS (*ingressus*, an entering). The entering of the sun into any of the twelve signs, or other parts of the zodiac.

INNA'TE (*innatus*, grown upon). Growing upon any thing by its end; as applied, in Botany, to the anther when it is attached by its base to the apex of the filament.

INNOVA'TIONS. A term applied, in Botany, to shoots which have not completed their growth, especially those of mosses.

INOPE'RCULAR (*in*, not, *operculum*, a lid). A term applied to univalve shells which have no operculum or lid.

INOSCULA'TION (*in*, and *osculum*, a little mouth). The union of vessels, or *anastomosis:* the latter term, however, is sometimes used to designate union by minute ramification; the former, a direct communication of trunks.

INSCRIBED FIGURE. In Geometry, a circle is said to be inscribed in a triangle or a polygon, when it touches all the sides of these figures. A triangle or a polygon is said to be inscribed in a circle, when all the angles of the former figures touch the circumference of the latter.

INSE'CTA (*insectus*, divided into segments). Insects; a class of articulated animals with six feet, which breathe by tracheæ, have a dorsal vessel for circulation, one pair of antennæ, compound eyes, generally pass through a distinct metamorphosis and acquire wings, and are oviparous with the sexes distinct. Burmeister divides them as follows:—

1. *Insecta ametabola.* Insects which do not undergo metamorphosis. The larva resembles the perfect insect, but is without wings. The pupæ of such species as have wings in their imago state possess rudiments of those organs. The pupa runs about and eats. To this division belong the orders Hemiptera, Orthoptera, and Dictyoptera.

2. *Insecta metabola.* Insects which undergo metamorphosis. The larva is a worm either with or without legs. The pupa is quiet; or, if it moves, it does not eat. To this division belong the orders Neuroptera, Diptera, Lepidoptera, and Coleoptera.

INSECTI'VORA (*insecta*, insects, *voro*, to devour). A group of mammiferous animals, considered by Cuvier as a family of the great carnivorous order, and characterized by their molar teeth being studded with sharp points, which enables them to devour insect prey. They comprise the mole, the hedgehog, the shrew, &c.

INSE'PARABLE ACCIDENT. A logical accident, which cannot be separated from the *individual* to which it belongs, though it may from the species, as for a person to be a *native of London.* See *Accident.*

INSESSO'RES (*insideo*, to sit upon). Perchers; an order of Birds, the foot of which is especially formed for grasping or perching—a peculiarity evinced by the situation of the hinder toe, which is invariably placed on the same level or plane as those in front.

INSOLA'TION (*in*, and *sol*, the sun). A term sometimes employed to denote exposure to the sun for the purpose of promoting the chemical action of one substance upon another.

INSOLUBI'LITY (*in*, not, *solvo*, to loose). A property, resulting from cohesion, by which a substance resists solution.

INSPISSA'TION (*in*, and *spissatus*, thickened). The process of making a liquid of a thick consistence.

INSTANCES, PREROGATIVE. Under this term Lord Bacon cites all those instances, or facts, which have a chief claim to be noticed in the attempt to interpret the laws of nature. He distributes them into three classes, viz. those which address themselves to the *understanding*, those which assist the *senses*, and those which conduce to *practice.*

INSTINCT. The spontaneous impulse by which animals perform certain actions. Under this term should be distinguished the *instinctive faculty*, which leads the duckling, untaught, into the water, and the chick, untaught, to avoid the water; and the *instinctive motions*, or those involuntary actions which are excited mediately through the nerves, as the closing of the eye-lids, the act of swallowing, &c.

INSULATION (*insula*, an island). A metaphorical term applied to a body containing a quantity of electric fluid, and surrounded by non-conductors, so that it is insulated, or its *communication* with other bodies is *cut off.*

INSU'RANCE. A per-centage paid for insuring property from fire, &c. When the charge is settled for any *kind* of property, it is reckoned per cent. upon the whole amount of it. The annual payment is called the *premium*, and the legal document, by which the securer is insured from loss so long as he continues to pay the premium, is called the *policy of insurance.*

I'NTEGER. Literally "whole;" and, hence, applied in arithmetic to a *whole number*, as distinguished from a fraction.

INTEGRAL CALCULUS. That branch of mathematical science which investigates the processes by which a function may be found such that its differential shall be a given quantity. It was formerly called the *inverse method of fluxions;* the function itself was called the *fluent*, or *flowing quantity;* it is now termed the *integral* or *sum* of the proposed differential.

INTEGRAL PARTICLES (*integer*, entire). The most minute particles into which any substance, simple or compound, can be divided, *similar* to each other, and to the substance of which they are parts. Thus, the smallest portion of powdered marble is still marble; but if, by chemical means, the calcium, the carbon, and the oxygen of this marble be separated, we shall then have the *elementary* or constituent particles.

INTENSITY. The degree or rate of the power or energy of any quality, as of heat and cold. In electricity, it denotes the degree to which a body is electrically excited.

INTENTION, FIRST and SECOND. In Logic, the "first intention" of a term is a certain *vague* and *general* signification of it, as opposed to one more *precise* and *limited*, which it bears in some particular art, science, or system, and which is called its "second intention." Thus, the term "bird" in its first intention signifies any individual of the feathered tribes; in the language of sportsmen, or its second intention, it is limited to the partridge.—*Whately.*

I'NTERAMBULA'CRA. The imperforate plates which occupy the intervals of the perforated plates, or ambulacra, in the shells of the Echinoderms. See *Ambulacra.*

I'NTERCALA'TION. The insertion of a supernumerary or *intercalary* day into the calendar for the purpose of preserving the account of time. See *Calendar.*

INTERCE'LLULAR SPACES. Spaces existing between the cells and other simple tissues of plants.

I'NTEREST. The consideration paid for the use of money. The *rate* of interest is the sum paid for the use of a *certain sum* for a *certain time*, generally one year. The sum originally lent is called the *principal;* the principal, together with its interest for any time, is called the *amount* for that time; the principal is also called the *present value* of the amount. Interest is called *simple*, when it is paid as soon as due, or when, if deferred, interest is not charged on interest; when the latter charge is made, the interest is called *compound.*

INTERFE'RENCE. A term applied, in Optics, to certain phenomena occasioned by the mutual action of the rays of light on one other: according to the distances respectively from which the rays of light proceeding from two luminous points fall upon the same spot, the effect is diminished or increased; and it is this mutual action which is called *interference.*

INTERJE'CTION. A sound uttered under the impulse of strong emotion. Interjections are indeclinable, stand in no close connexion with the sentences in which they occur, and cannot be properly considered as a distinct part of speech.

INTERME'DIATE. A term applied to a third substance, employed for combining together two other substances; thus, alkali is an *intermediate* between oil and water, forming soap.

I'NTERNODE (*inter*, between, *nodus*, a node or knot). *Merithallus.* That portion of the stem of a plant which occurs between two nodes.

INTERPOLA'TION. This term denotes, simply, the insertion of something into original matter. In Algebra and Astronomy, it is a method adopted for filling up the intermediate terms of a series of numbers or observations, by numbers which follow the same law.

INTERROGA'TION, FALLACY OF. A logical fallacy, which may be referred to the head of "Ambiguous Middle." It consists in asking several questions which appear to be but one: so that whatever *one* answer is given, being of course applicable to one only of the implied questions, may be interpreted as applied to the other. The refutation is, to reply *separately* to each question, *i. e.* to detect the ambiguity.

INTERRU'PTED. A term denoting a disturbance of a normal arrangement. A leaf is said to be *interruptedly* pinnate, when some of the pinnæ are much smaller than the rest, or absent.

INTERSCE'NDENT. A term applied by Leibnitz to those algebraical quantities of which the exponents of their powers are irrational; the term denotes their holding an intermediate place between algebraic and transcendental quantities.

INTERVAL, MUSICAL. A term applied to a certain relation between musical notes, which depends on the number of their vibrations. The simplest or most consonant interval is that of the *octave*, in which the higher note makes twice as many vibrations as the *fundamental note* from which it is derived; its ratio is that of 1 : 2 : 4 : 8, &c. *Compound* intervals are those which exceed an octave, and they are named according to the distance of the two boundary notes.

INTERVE'NIUM (*inter*, between, *vena*, a vein). That portion of the parenchyma of leaves, which lies between two or more veins or veinlets.

INTESTI'NA. An order of worms which inhabit the bodies of other animals. They are distinguished by Cuvier into the *Cavitaria*, which have cavities or stomachs; and the *Parenchymata*, or cellular-bodied, as the tape-worm.

INTE'XINE. That coating of the pollen-grain which is situated next to the *extine*, constituting a fourth layer of the pollen-grain in certain plants.

I'NTINE. The inner coat of the shell of the pollen-grain in plants. See *Extine.*

I'NTROIT (*introitus*, an entering in). A term employed in ancient chronicles, signifying the first two or more words which form the commencement of a mass, which, from being appropriated to a certain Sunday, or other festival, gave the name of such commencement or "introit" to those days. Thus, the term "adorate Dominum" is the introit and name of the third Sunday after the Epiphany.

INTRO'RSE (*introrsus*, qu. *introversus*, inwardly). Turned inwards; as the anthers of plants in which the line of dehiscence is towards the axis of the flower. See *Extrorse.*

INTUI'TION (*intueor*, to look into). That simple faculty of the mind by which we immediately perceive the agreement or disagreement of two ideas. In this the mind is at no pains of proving or examining, but perceives the truth as the eye does the light, only by being directed to it. *Intuitive truth* has accordingly been defined as that "which is perceived immediately on a bare attention to the ideas under review."

INTUS-SUSCEPTION (*intus*, within, *suscipio*, to receive). The inversion of a part of a tube within a contiguous part. When it takes place downwards, it may be termed *progressive;* when upwards, *retrograde*. The term *intus-susception* is also applied to the process of nutrition, or the transformation of the components of the blood into the organized substance of the various organs.

I'NULIN. A starch-like substance which is spontaneously deposited from a decoction of the root of the *Inula Helenium*, or Elecampane.

INVAGINA'TION (*in*, in, *vaginá*, a sheath). A sheathing of one part within another; a term synonymous with *intussusception*.

INVA'RIABLE. In Mathematics, a term synonymous with *constant*, and applied to a quantity which is absolutely invariable. It may also denote a function which is not absolutely invariable, but which does not vary in the processes required by a given equation.

INVE'NTION. A term frequently confounded with *discovery*, which simply means the finding out something already existing. *Invention*, however, includes *conception*, and relates to the mental operation by which objects are selected and arranged with reference to a particular result. The polarity of the magnet was *discovered;* its application to navigation was *invented:* the binomial theory was a *discovery;* the method of fluxions an *invention.*

INVERTEBRA'TA. A negative and unsatisfactory term by which Lamarck designated all those animals which are not furnished with a vertebral column or backbone.

INVOLU'CRUM (*involvo*, to wrap in). In Botany, a whorl of bracts which surround several flowers, as in composite and umbelliferous plants. In the latter family, the bracts which surround the general umbel are called the *universal* involucrum; and those which surround the umbellules, a *partial* involucrum, or *involucellum.*

I'NVOLUTE. That kind of curve which is described by the extremity of a cord as it is unrolled from the arc of another curve about which it has been lapped, the latter being called the *evolute.* The two may be described as, the curve unrolled, and the curve from which it is unrolled. See *Curve.*

INVOLU'TION (in Algebra). The process of finding the *powers* of quantities. The examples of involution are, therefore, only examples of multiplication where the factors are all the same. See *Evolution.*

I'ODINE (*ἰώδης*, or *ἰοειδὴς*, violet-coloured, from *ἴον*, a violet, and *εἶδος*, likeness). A non-metallic, crystallized, solid substance, found in marine plants, in the ocean, and in mineral springs; it becomes volatile by a slight increase of temperature, and forms a beautiful *violet* vapour.

1. *Iodal* (*iod*ine and *al*cohol). An oleaginous liquid obtained by the action of iodine upon nitric alcohol.

2. *Iodic Acid.* An anhydrous acid, termed *oxiodine* by Davy, and produced by the combination of iodine with oxygen. It combines with metallic oxides, and forms salts which are termed *iodates.*

3. *Iodides,* or *Iodurets.* The compounds of iodine with metals, and with the simple non-metallic substances.

4. *Iodous Acid.* A compound prepared by the action of iodine on chlorate of potash,—probably by the combination of iodine and chlorine.

5. *Chloriodic Acid.* This is also called *chloride of iodine;* and is formed by the absorption of chlorine by dry iodine.

I'OLITE. A variety of quartz, intermediate in colour between violet-blue and blackish-blue, occurring in primitive rocks in Finland.

I'ON (ἰὸν, that which goes; neut. part. of εἶμι, to go). A term introduced by Faraday, explanatory of his views of electrolysis. He is of opinion that the force does *not* emanate from the poles of the battery, but that it resides in the substance undergoing decomposition, of which one element, or *ion,* goes to the positive, the other element, or *ion,* to the negative, end of the battery. The *ion* which goes to the *anode,* or positive pole, he terms *an-ion;* that which goes to the *kathode,* or negative pole, *kat-ion.* See *Electrode.*

IRIDA'CEÆ. The Cornflag tribe of Monocotyledonous plants, represented by the iris and the crocus. Smooth herbaceous plants, with *leaves* equitant; *flowers* hexapetalous, triandrous; *stamens* 3; *ovarium* 3-celled, many-seeded.

IRIDE'SCENT (*iris,* a rainbow). The property of shining with many colours, like the rainbow.

IRIDINI'NÆ. A sub-family of the *Unionidæ,* or River Mussels, named from the genus *iridina.*

IRI'DIUM (*iris,* a rainbow). The most infusible of all known metals, named from the variety of colours it displays while dissolving in hydro-chloric acid.

IRON. The most abundant of the true metals, occurring in the form of oxides and *clay iron-ore,* and entering into the composition of many rocks, which frequently owe their grey colour to it.

Cast or *pig iron* is the name given to the metal when first extracted from its ores. Its varieties are the *white* cast iron, which is extremely hard and brittle, and appears to consist of small crystals; *grey* or *mottled* cast iron, so called from the inequality of its colour, softer and less brittle than the preceding; and *black* cast iron, the most unequal in its texture, and least cohesive of the three.

IRON-PYRITES. *Yellow sulphuret of iron.* An ore of iron, of a brass-yellow or greenish-yellow colour, compact or fibrous, emitting a sulphurous smell when struck; granulated, or even earthy, when impure.

IRONSTONE. A stratum of the coal-formation, forming thin beds, or disposed in globular or depressed masses, alternating with layers of shale. It is of a brown or grey colour, and is principally composed of iron combined with oxygen, carbonic acid, and water, usually with a little alumina, silica, and lime.

IRRA'TIONAL NUMBERS. A term applied, in Algebra, to those numbers or quantities, the roots of which are incommensurable by unity, and the exact value of which can therefore never be determined; in other words, to those numbers or quantities which are inexpressible by an arithmetical ratio, and are therefore "arithmetically irrational." These numbers are generally called *surds,* from the Latin *surdus,* deaf or senseless.

IRREDU'CIBLE CASE. An algebraical term, applied to that class of cubic equations in which Cardan's formula fails in its application. The reason of the failure arises from the imaginary expression of the formula, and from the fact that the cubic equations in question have all the three roots real.

IRREGULAR BIVALVES. Those bivalves which are not uniform in shape throughout the species; a deviation almost confined to the perforating groups.

IRREGULAR MASSES. A term applied by MacCulloch to rocks of no determinate form, and of any size, as granite, greenstone, and porphyry.

I'SERINE. An iron-black mineral, containing titanium and uranium, found near the origin of the river Iser, disseminated in granite sand, and in alluvial soil, together with pyrope, in Bohemia.

ISO- (ἴσος, equal). This prefix denotes *equality,* or *similarity.* Hence,—

1. *Iso-barysm* (βάρος, weight). Simi-

larity of weight, supposed to be the cause of the identity in the size and shape of molecules which cohere into the crystalline form.

2. *Iso-bryous* (βρύω, to grow). That which grows equally; a term applied by some writers to dicotyledonous plants, which, having two cotyledons, grow with equal force on the two sides of the axis. For the same reason, such plants have been called *iso-dynamous*, from δύναμις, force. See *Anisobryous.*

3. *Iso-chromatic* (χρῶμα, colour). Having the same colours, as applied to lenses. The light which is decomposed by doubly refracting crystals, forms a double series of coloured curves of different forms, arranged in a different order, each curve in the one series having a curve corresponding to it in form and colour in the other. The two curves which have the same tint, are called *iso-chromatic.*

4. *Iso-chronous* (χρόνος, time). That which occurs in equal times; as the strokes of the pulse, the vibrations or oscillations of pendulums of the same length, &c. Hence, the term *iso-chronism* is applied to that property of all systems which are *in equilibrio*, by which the retardation or acceleration of the oscillations is not perceptibly influenced by any disturbing force.

5. *Iso-clinic Lines* (κλίνω, to incline). Lines of equal inclination or dip; a term applied to curves which connect those places in the two hemispheres where the dip of the magnetic needle is equal; they surround the globe, running nearly parallel with the magnetic equator. These curves coincide in position with the isothermal lines. See *Aclinic Line.*

6. *Iso-cyclous* (κύκλος, a circle). A term applied to animals which are composed of a succession of equal rings, as some of the Crustacea.

7. *Iso-dynamic Lines* (δύναμις, power). Lines of equal power; a term applied by Hansteen to lines which connect those places where the intensity of the terrestrial magnetism has been found to be equal, and which resemble in form and position the isoclinic lines, though they approach still more nearly to the isothermal lines.

8. *Iso-gonic Lines* (γωνία, an angle). Lines of equal declination; a term applied to lines connecting those places which have an equal declination west or east. Most of these lines are drawn around two points near to the north and south poles of our planet, called the *magnetic poles of the earth*, or, more correctly, *magnetic poles of convergence.*

9. *Iso-merism* (μέρος, part). A term in chemistry expressive of the relation existing between bodies, which agree in composition but differ in properties. *Isomeric bodies* have in general been found to agree in the relative proportion of their constituents only, and to differ either in the aggregate number of the atoms composing them, or in the mode of arrangement of these atoms. Berzelius has employed three terms to include the different cases of these bodies, viz. *isomeric*, *polymeric*, and *metameric.*

10. *Iso-morphism* (μορφὴ, form). A term in chemistry applied by Mitscherlich to the relation in *form* which exists in different bodies, as a general consequence of similarity of composition. The law at which he arrived is as follows:—The same number of atoms combined in the same way produce the same crystalline form; and crystalline form is independent of the chemical nature of the atoms, and determined only by their number and relative position.

11. *Iso-morphous* (μορφὴ, form). A term applied to some groups of chemical substances, which, having the same crystalline form, are found to enter into analogous combinations, which also respectively present the same form; and to some other groups which have been observed to enter into similar combinations, having very similar crystalline characters. Of these iso-morphous bodies, the salts of phosphoric and arsenic acids afford remarkable examples.

12. *Iso-perimetrical* (περίμετρον, circumference). Having the same length of perimeter, circumference, or bounding line. Of all iso-perimetrical figures, that is the greatest, which contains the most sides or angles; hence, the circle is the most capacious of all iso-perimetrical figures.

13. *Iso-poda* (ποὺς, ποδὸς, a foot). A group of crustaceous animals, which have seven pairs of similar unguiculate feet, attached to seven moveable segments behind the cephalic. A characteristic example is found in the *oniscus*, or woodlouse.

14. *Iso-pyre.* A new mineral found in Cornwall, imbedded in granite; it resembles obsidian, or even some varieties of iron slag.

15. *Iso-sceles* (σκέλος, a leg). The

designation of a triangle of which two sides, or *legs*, are equal.

16. *Iso-stemonous* (*στήμων*, a stamen). A term applied by De Candolle to those plants, the stamens of which are equal in number to the petals. See *Anisostemonous.*

17. *Iso-thermal Lines* (*θέρμη*, heat). Lines of equal temperature; a term applied, in physical geography, to lines connecting all those places on the surface of the Globe which have the same mean temperature. Lines drawn through places having the same summer, and the same winter temperatures, are termed, respectively, *iso-theral* (*θέρος*, summer), and *iso-cheimal* (χεῖμα, winter) lines; while lines drawn through places having other common temperatures, receive other appropriate names.

I'STHMUS. A narrow neck of land lying between two seas, and connecting two masses of land greater than itself.

ITACONIC ACID. Another name for the pyrocitric or citricic acid.

I'TTNERITE. A rare mineral, consisting chiefly of silica, alumina, and soda, together with some hydrosulphuret; named after Ittner.

J

JACULATRI'CES (*jaculum*, a dart). The name given by Macgillivray to an order of birds, from the peculiar form of their bill, and their rapid flight. The families composing the order are the Alcedinæ, the Galbulinæ, and the Trogoninæ, of which the last two have the feet zygodactyle.

JADE. *Nephrite.* A mineral substance found in granite and gneiss, in Switzerland, and divisible into the two varieties of common nephrite and amazonian stone. The name has, however, been applied to various minerals which resemble one another in little else than in colour.

JA'MESONITE. A mineral consisting principally of the sulphurets of antimony and of lead, and named after Professor Jameson.

JA'RGON. Jargon of diamond is a designation of one of the varieties of zircon.

JA'SPER. A siliceous substance of various colours, occurring in veins in trap rocks, in volcanic rocks, and in the primary and secondary series.

JA'TROPHIC ACID. *Crotonic Acid.* An acid procured by the saponification of croton oil.

JE'FFERSONITE. A variety of *pyroxene;* a new mineral found in Franklinite and garnet, in New Jersey.

JE'RVINE. A vegeto-alkali, found in the root of *veratrum album.*

JET, or PITCH COAL. A black velvet-coloured bitumen, used for fuel, and for making vessels, &c. In Prussia it is called *black amber*, and is cut into rosaries and necklaces. Ure says the word *jet* is derived from the river *Gaga* in Lesser Asia.

JEWELLERS' PUTTY. Ignited and finely-levigated oxide of tin, used by jewellers for polishing hard objects.

JOINTS. In Geology, fissures or lines of parting in rocks, often at right angles to the planes of stratification. The partings which divide columnar basalt into prisms, are joints.

JU'DGMENT. In Logic, an operation of the mind, by which we compare two ideas or notions which are the objects of apprehension, whether complex or incomplex, and pronounce upon their agreement and disagreement. Judgment is, therefore, either *affirmative* or *negative.*

JU'GUM. The Latin term for a *yoke*, and hence applied to a pair of opposite leaflets on the petiole of a pinnate leaf. Thus a leaf with one pair is called *unijugal;* with two pairs, *bijugal*, &c.

Juga in Umbelliferous Plants. The term *juga* also signifies *ridges*, and is hence applied to the elevated portions by which the carpels of umbelliferous plants are traversed; of these juga, five are called *primary*, and four, alternating with them, *secondary.*

JULIAN CALENDAR. The mode of reckoning the divisions of the year, adopted by Julius Cæsar, and afterwards corrected by Gregory XIII. It is explained under the term *Bissextile.* The Russians still retain the Julian style, and their year consequently begins twelve days later than ours.

JULIAN PERIOD. A revolution of 7980 years, reckoned from 4713 years before our era, and produced by the continued multiplication of the solar cycle, the lunar cycle, and the cycle of indiction, viz. 19, 28, and 15. See *Cycle*.

JU'LIDÆ. The lowest division of the Myriapods, so named from the *julus*, or common millepede.

JUNGERMANNIA'CEÆ. An order of creeping moss-like plants, named from the genus *jungermannia*, and distinguished from several allied orders by the *theca* opening by valves, without an operculum. In all the orders the spores are mixed with *elaters*.

JUNO. A telescopic planet, situated in the solar system between Mars and Jupiter, and said to be 1320 miles in diameter. Its distance from the sun is about 256 millions of miles, and it completes its revolution in 4 years, 128 days. This planet was discovered, in 1804, by Mr. Harding of Bremen.

JUPITER. The largest of the planets, and, next to Venus, the most brilliant. It is 1470 times the size of the earth. It completes its orbit round the sun in 4332·596 days. It is accompanied by four satellites.

JURA LIMESTONE. A term applied to the limestones belonging to the Oolitic group, and constituting the chief part of the mountains of the Jura, between France and Switzerland.

JURA'SSIC SYSTEM. A term synonymous in continental writers with our *Oolitic System*.

JURISPRU'DENCE. *General jurisprudence* is the science or philosophy of positive law, as distinguished from *particular jurisprudence*, or the knowledge of the law of a particular country.

K

KAKO'XENE. A crystalline mineral, found in iron-stone, in Bohemia.

KALEI'DOPHON (καλὸς, beautiful, εἶδος, form, φώνη, sound). An instrument, invented by Mr. Wheatstone, for exhibiting the vibrations of an elastic rod. If a rod of this kind, fastened at one end, be set in motion by a blow, or bending, it will describe paths which do not always lie in the same plane, but return in variously-curved lines. If the free end of the rod be surmounted with a polished knob, the curves will be exhibited in a beautiful manner to the eye.

KALEI'DOSCOPE (καλὸς, beautiful, εἶδος, form, σκοπέω, to see). A well-known apparatus, invented by Sir D. Brewster, by which the image of an object is multiplied by repeated reflections from inclined mirrors, placed opposite to one another.

KALI. A term of Arabic origin, denoting a particular plant; hence the word *al-kali*, with the article, originally signified the particular residuum obtained by lixiviating the ashes of that plant; the term was then used for *potassa*.

KA'LOTYPE (καλὸς, beautiful, τύπος, an impression). The art of fixing photographic images upon surfaces of silver, first suggested by Wedgewood, and subsequently improved by Daguerre (See *Daguerreotype*). Talbot employs for this purpose a paper which is rendered peculiarly susceptible to light, and which is termed *kalotype paper;* a negative picture is formed upon the paper in the *camera obscura*, and fixed by means of bromide of potassium.

KAOLIN. China-clay; a fine pure clay prepared by levigation from mouldering granite, and employed in the manufacture of porcelain.

KA'RPHOLITE (κάρφος, a straw, λίθος, a stone). A yellow mineral, occurring in thin prismatic concretions.

KARPHOSIDE'RITE (κάρφος, a straw, σίδηρος, iron). A straw-coloured mineral, resembling iron-sinter, and occurring in Labrador.

KA'RSTENITE. Another name for *anhydrite*, or prismatic gypsum.

KA'THODE (κατὰ, downwards, ὁδὸς, a way). A term applied by Mr. Faraday to that part of the surface of a decomposing body at which the electricity departs—the part immediately touching the negative pole. See *Anode*.

KA'TION (κατιὸν, that which goes down). A term applied by Mr. Faraday to the body which passes to the negative pole, or *kathode*, of the decomposing body, as it is separated by electricity. See *Anion*.

KEDRIA TERRESTRIS. Barbadoes tar; a mineral oil. See *Bitumen*.

KEEL. *Carina*. A term applied by botanical writers to the two lower petals of a papilionaceous corolla, which cohere by their lower margins, so as to present a *keeled* or boat-like form.

KEEPER OF A MAGNET. A piece of soft iron, which is placed in absolute contact with the poles of a magnet when not in use. The keeper tends, by induction, to maintain, and even exalt, the power of the magnet, whose poles are thus employed in producing the opposite magnetism in its respective ends.

KE'LLOWAY ROCK. A term applied to beds of limestone occurring in the lower part of the Oxford or Clunch clay; it is often composed of irregular nodules, and is sometimes full of shells, among which predominate ammonites and large gryphææ.

KELP. *Varec.* The crude soda obtained from the ashes of the *Fuci* in Holland and on the northern coast of France. It is used in the composition of soap, in the manufacture of alum, and in the formation of crown and bottle glass. See *Barilla.*

KEPLER'S LAWS. The laws of elliptic motion about the sun as a focus, and of the equable description of areas by lines joining the sun and planets, were originally established by Kepler, from a consideration of the observed motion of Mars, and were by him extended, analogically, to all the other planets. These laws are three:—

1. That every planet moves so that the line drawn from it to the sun describes about the sun areas proportional to the times.

2. That the planets all move in elliptic orbits, of which the sun occupies one of the foci.

3. That the squares of the times of the revolutions of the planets are as the cubes of their mean distances from the sun.

KERATO'PHYTA (κέρας, κέρατος, horn, φυτὸν, a plant). An old name for those polyps which have a horny axis, as distinguished from the *lithophytes*, or strong polyps.

KERMES ANIMAL. *Coccus Ilicis.* A hemipterous insect, found upon the *quercus ilex*, and formerly used for dyeing scarlet: cloth so dyed was called *coccinum*, and persons wearing this cloth were termed by the Romans *coccinati.* The drug was termed *grana kermes*, from the resemblance of the dried insects to grains or seeds.

KERMES MINERAL. Formerly, *Panacea Glauberiana;* a sulphuret of antimony; so named, from its resemblance, in colour, to the insect kermes.

KEUPER. A German name for a member of the Upper New Red Sandstone formation. Remains of reptiles are said to have been found in it near Warwick.

KEY (in Music). The particular diatonic scale, in which a composition begins and ends, and which prevails more or less in a given piece of music. There are twelve major and twelve minor keys.

KILLAS. The technical name applied by the Cornish miners to clay-slate, or the grauwacke slate of other countries.

KI'LLINITE. A mineral resembling spodumene, discovered in granite veins at Killiney, near Dublin.

KI'MMERIDGE CLAY. A thick bed of clay, constituting a member of the Oolitic Group, and occurring well developed at Kimmeridge, in the isle of Purbeck, Dorsetshire.

KING'S YELLOW. A paint, of which the colouring principle is orpiment, or the sesqui-sulphuret of arsenic.

KINGDOM. A term denoting any of the principal divisions of nature; thus we have the *organic kingdom*, comprehending substances which organize, and the *inorganic kingdom*, comprehending substances which crystallize.

KINIC ACID. *Quinic acid.* An acid found in the Cinchona barks. It forms salts called *kinates.*

Kinoïle. A neutral substance produced by the calcination of a kinate by a gentle heat.

KITE, ELECTRICAL. An apparatus for proving the existence of sensible electricity in the atmosphere. A wooden rod, of several feet in length, fastened by its lower end to a glass tube, and surmounted at the other by a *pointed* brass or copper wire, forms an insulated conductor to attract the electricity. A second wire, attached to the first, is connected with a delicate electrometer, which exhibits the electricity conducted to it from the atmosphere.

KNE'BELITE. A grey spotted mineral, consisting of silica, iron, and manganese.

KNOWLEDGE. "Knowledge implies three things; 1st, firm *belief;* 2ndly, of what is *true;* 3rdly, on sufficient *grounds.* If any one, *e. g.* is in *doubt* respecting one of Euclid's demonstrations, he cannot be said to *know* the proposition proved by it; if, again, he is fully *convinced* of any thing that is not *true*, he is mistaken in supposing himself to know it; lastly, if two persons are each *fully confident*, one that the moon is inhabited, and the other that it is not (though one of these opinions must be *true*), neither of them could properly be said to *know* the truth, since he cannot have sufficient *proof* of it."—*Whately*.

KOBELL'S DISCOVERY. A method proposed by Kobell of Munich by which pictures drawn in bistre or Indian ink may be multiplied by the process of electrotype, or galvano-plastics.

KO'LLYRITE. A white mineral found in porphyry, in Hungary.

KO'NIGINE. A green mineral, probably consisting of a subsulphate of copper.

KOU'PHOLITE (κοῦφος, light, λίθος, a stone). A variety of prehnite found near Barèges.

KRAME'RIC ACID. A peculiar substance supposed to exist in the root of the *krameria triandra*.

KUNDAH Oil. An oil obtained from the seeds of the Carapa Toulouconna, also called *tallicoonah oil.*

KUPFERNICKEL. The German name for sulphuret of nickel, in which the metal is generally mixed also with arsenic, iron, and cobalt.

L

LABA'RRAQUE'S SOLUTION. A disinfecting liquid, consisting of a solution of the chlorides of lime and of soda. It is analogous to the well-known bleaching powder, chloride of lime.

LABE'LLUM (dim. of *labium*, a lip). A little lip; the botanical designation of the *lip-like*, or undermost, petal of orchidaceous plants.

LABIA'TÆ (*labium*, a lip). The Labiate or Mint tribe of Dicotyledonous plants. Herbaceous plants, with *leaves* opposite; *flowers* irregular, unsymmetrical; *stamens* four, didynamous, inserted into the corolla; *ovarium* deeply 4-lobed; *fruit* 1—4 small nuts.

LA'BIATE (*labium*, a lip). A botanical designation of a gamopetalous calyx or corolla, which is separated into two unequal divisions, resembling *lips*, the one anterior, the other posterior, with respect to the axis. Hence, the term *bilabiate* is more commonly used. This form of the floral envelopes is characteristic of the Mint tribe. See *Labiatæ*.

LA'BORATORY. A room properly furnished for the performance of chemical operations.

LA'BRADOR FELSPAR. *Labradorite.* A species of felspar found chiefly on the coast of Labrador, and in the transition syenite of Laurwig in Norway. It is also called *opalescent* felspar, from its often exhibiting a beautiful play of colours in cut and polished specimens. It is probably a variety of albite.

LA'BRIDÆ. A family of acanthopterygious fishes, named from the genus *labrus*, or the wrasse. They comprise the Parrot-fishes, so remarkable for the convex form of the jaws.

LABRUM. Literally, the extremity of the lips; also, the brim of any vessel. In Entomology it is applied only to the lower lip of insects.

LABYRI'NTHODON (λαβύρινθος, a labyrinth, ὀδοὺς, a tooth). The name now given to the *Cheirotherium*, a supposed crocodilian animal of considerable size, to which have been referred the singular footsteps found impressed on several beds of marly sandstone in various parts of England and Europe, bearing a remarkable resemblance to the human hand. The present name is derived from the complex or labyrinthine structure of a section of the tooth, as seen under the microscope.

LAC (*laak*, Arab). A resinous substance, improperly termed a gum, deposited by the insect *coccus lacca*, on the leaves and branches of several trees, over its eggs, as a present protection, and as a future food for the maggot. *Stick-lac* is the substance in its natural state, encrusting twigs; *seed-lac* is the lac separated from the twigs, and of a granulated form, like mustard seeds; *shell-lac* is the substance obtained after purification; *lump-lac* is the seed-lac melted and formed into cakes. *Lac-dye, lac-lake,* or *cake-lac*, are designations of the colouring matter extracted from the stick-lac.

LAC LUNÆ. Moon-milk; a snow-white substance, resembling chalk, and consisting almost wholly of alumina, saturated with carbonic acid.

LACCIC ACID. An acid obtained from stick-lac, forming salts called *laccates.*

LACCIN. A principle discovered in lac, intermediate between wax and resin.

LACE'RTA. The Lizard; a modern northern constellation, consisting of sixteen stars. It is surrounded by Andromeda, Cepheus, Cygnus, and Pegasus.

LACERTI'NIDÆ (*lacertus*, a lizard). A family of Saurian reptiles, including the common lizards of this country, and most of the Saurians of active habits. They are characterized by their small head, thick neck, and long, slender, forked tongue.

LACI'NIATED (*lacinia*, the fringe of a garment). A term applied, in Botany, to those leaves which are divided by deep, taper-pointed incisions. Such leaves are also said to be *slashed*, decomposed, or multifid. The inflexed point of the umbelliferous petal is called the *lacinula.*

LA'CQUER. A solution of shell-lac in alcohol.

LA'CTEALS (*lac*, *lactis*, milk). Minute vessels which, in the animal economy, absorb, or take up, the chyle, or *milk-like* fluid, from the alimentary canal. See *Absorption.*

LACTIC ACID (*lac*, *lactic*, milk). An acid generated whenever milk, and perhaps most animal fluids, become spontaneously sour, or when the juice of beetroot is preserved for some months at a high temperature. Its salts are called *lactates.*

LA'CTINE (*lac*, milk). *Saccholactin.* Sugar of milk; obtained by evaporating the whey of milk to crystallization, and purifying the first product by animal charcoal and a second crystallization.

LACTO'METER (*lac*, *lactis*, milk, *μέτρον*, a measure). A graduated glass tube, for ascertaining the relative quantity of cream afforded by milk. A more correct term would be *galactometer.*

LACTU'CIC ACID. An acid discovered in the juice of the *lactuca virosa,* or wild lettuce.

LACU'NÆ (*lacus*, a lake). A term applied by Link to the *air-cells* which occur in the tissue of plants. In lichens, they are the small hollows or pits which occur on the upper surface of the thallus; and hence the term *lacunose* is applied to a body which has large deep lacunæ or depressions on the surface.

LACU'STRINE (*lacus*, a lake). Belonging to a lake. A *lacustrine deposit* consists of alluvial matter carried down by rivers and deposited at the bottom of lakes.

LÆMODI'PODA (*λαιμὸς*, the throat, *πόδες*, feet). A group of crustaceous animals, which have the anterior pair of feet attached to the cephalic segment; they have no post-abdominal branchiæ; the eyes are sessile, and the mandibles without palpi. A characteristic example is found in the *cyamus*, commonly called the whale-louse, from its infesting the cetacea as a parasite.

LAGOON or LAGUNE. An extensive sheet of shallow water, formed either by the encroachment of the sea or rivers upon the land, or by the separation of a portion of the sea by the intervention of a bank. Thus, there are *fluvial* and *marine* lagunes.

LA'GRIIDÆ. A family of coleopterous insects, of the section Heteromera, named from the genus *Lagria*, one species of which is indigenous in this country.

LAKE. An insoluble compound, formed by precipitating colouring matter with an earth or oxide. The principal lakes are *carmine*, obtained from cochineal, by precipitation with Roman alum; *Florence lake*, prepared, in the same process, from the sediment of cochineal, by precipitation with solution of tin; and *madder lake*, prepared from Dutch crop madder, by precipitation with alum.

LAKE (in Geography). An inland body of water not connected with the ocean or any of its branches. It is formed by accumulation of water in a basin, or depression of the surface, deeper than the general slope of the water-line of valleys. There are four distinct kinds of lakes:—

1. Those which have no outlet, and which do not receive any running water. They are usually very small; some appear to be the craters of extinct volcanoes filled with water.

2. Those which have an outlet, but which receive no running water. They have been formed by springs flowing into some large hollow; the outlets are, in some cases, the beginnings of very large rivers. These lakes are usually in elevated situations.

3. Those which both receive and discharge streams of water, as the immense bodies of water in North America, between Canada and the United States, the

outlet of which is the great river St. Laurence; lake Baikal, in Asiatic Russia, which sends forth a large stream, which joins the Yenesei.

4. Those which receive streams of water, and often great rivers, but have no visible outlet whatever, as the Caspian Sea and lake Aral, both in the west of Asia. These are both *salt* lakes, and were, perhaps, formerly connected with the Black Sea.

LA'MANTINE. The sea-cow; a living species of the herbivorous Cetacea, or Whale tribe, which inhabits the mouths of rivers on the coasts of Africa and South America.

LAME'LLA (dim. of *lamina*, a plate). The *lamellæ* of the agaric are those parallel plates, or *gills*, in which the sporules lie; collectively, they constitute the *hymenium*. But the term *lamellar* is applied to any part which is surmounted by little plates, or lamellæ, as the style of many plants.

LA'MELLATED (*lamella*, a little plate). A term applied to shells whose substance is composed of lamellæ, or very thin plates, which do not present a solid surface, as in the pearl-oyster.

LAME'LLIBRANCHIA'TA (*lamella*, a little plate, *branchiæ*, gills). A class of bivalve conchiferous mollusca, which respire by gills in the form of vascular plates of membrane attached to the mantle. The common oyster and mussel are examples of this best known class of acephalous mollusca.

LAMELLICO'RNES (*lamella*, a little plate, *cornu*, a horn). A family of the pentamerous *Coleoptera*, characterized by the peculiar conformation of the antennæ, which terminate in a lamellated mass. They include the scarabæi, and the lucani or stag-beetles.

LAMELLI'FEROUS (*lamella*, a little plate, *fero*, to bear). Having a structure consisting of thin plates or leaves, like paper.

LAME'LLIFORM (*lamella*, a little plate, *forma*, shape). Shaped like a thin plate or leaf.

LAME'LLIROSTRES (*lamella*, a little plate, *rostrum*, a beak). The name given by Cuvier to the great family of the *Anatidæ*, comprising the duck, the goose, the swan, &c.

LA'MINA. The Latin term for a plate, as of metal. In Geology, the word *laminæ* denotes the smaller layers of which a stratum is composed.

LA'MINARITES. The name given by Brongniart to a species of fossil fucus, found in the secondary strata of Aix, near La Rochelle.

LAMP-BLACK. A species of charcoal, produced by collecting the smoke from a lamp; but it is generally obtained by burning resinous substances, as the dregs of pitch, or pieces of fir-wood, in furnaces, and collecting the smoke in a close-boarded chamber.

LAMPIC ACID. An acid obtained by Sir H. Davy from the combustion of ether. It is merely acetic acid, combined with some etherous matter.

LAMPY'RIDÆ (λάμπω, to shine). A family of Coleopterous insects, of the section Malacodermi, named from the genus *lampyris*, to which belongs the familiar species *noctiluca*, or the glow-worm, remarkable for its emission of phosphorescent light.

LANA PHILOSOPHICA. Philosophical wool, flowers of zinc, or the snowy flakes of white oxide of zinc, which arise and float in the air from the combustion of that metal.

LAN'CEOLATE (*lancea*, a lance). Lance-shaped; narrowly elliptical, tapering to each end, as the leaves of many plants.

LA'NDSLIP. A portion of land which has slipped away, owing to the disturbance of an earthquake, or from being undermined by the washing away of its lower beds by water.

LANE'S CHARGING-JAR, or *Spark-measurer*. An apparatus for ascertaining the intensity of an electrical charge, by measuring the length of the spark, and thus at the same time determining the power of a machine; and also for obtaining a number of successive charges of equal intensity.

LA'NIADÆ (*lanius*, the shrike). The Shrikes; a family of the Insessores, or Perching birds, or the Excurtrices of Macgillivray, in which the bill is abruptly hooked at the end, and the notch is sometimes so deep as to form a prominent tooth on each side. See *Dentirostres*.

LANIA'RIFORM (*lanio*, to cut or tear, *forma*, shape). Shaped like the canine teeth of the Carnivora, which are called *laniaries* from their office.

LANTA'NUM (λανθάνω, to be concealed). A newly-discovered metal, so named from its properties being *concealed* by those of cerium, with which it is found united. It occurs in the cerite of Bastnas.

LAPIDIFICA'TION (*lapis*, a stone, *fio*, to become). The process of conversion into stone.

LAPI'LLI (*lapillus*, dim. of *lapis*, a stone). Small stones; small volcanic cinders.

LAPIS. A generic term, signifying all kinds of stone: thus, *lapis calcareus* is limestone; *lapis infernalis* is an old term for caustic potash; *lapis calaminaris* is the impure carbonate of zinc; *lapis comensis* is potstone, an intimate mixture of talc and asbest; *lapis lazuli* is a zinc-stone, from which ultra-marine is prepared, &c.

LA'RBOARD. By a person standing at the stern of a ship, and looking towards the prow, the left-hand side is termed the *larboard*, and the right-hand side the *starboard*.

ow, by
aw,
ot used
Port",

LA'RIDÆ (*larus*, the sea-gull). The Gull tribe; a family of the *Natatores*, or Swimming birds, including the gull, the petrel, the albatross, &c., in which the powers of flight are considerable, while those of swimming and diving are defective.

LA'RVA (Lat., a mask). A caterpillar; the earliest state of insect existence, so named by Linnæus because in this condition the perfect form of the insect is concealed, as it were, under a mask. The term *larva* is applied to the grub, the caterpillar, and the maggot. See *Pupa*.

LARVI'PAROUS (*larva*, and *pario*, to produce). A designation of those insects which produce their young in the condition of larvæ.

LA'SIONITE. A phosphate of alumina from Amberg in Bavaria. It is a variety of hydrargyllite.

LATE'BRICOLÆ (*latebra*, a hiding-place, *colo*, to inhabit). A family of Spiders, which hide themselves in burrows and fissures, which they line with a web.

LATENT HEAT. That quantity of heat which is absorbed during the conversion of a solid into a liquid, or of a liquid into a vapour, without raising the temperature in the least degree. See *Caloric*.

LA'TERAL (*latus*, *lateris*, the side). Belonging to the sides of a body. Thus, the lateral teeth of bivalves, where they exist, are on one or both sides of the cardinal teeth, which are always central.

LATERI'GRADA (*latus*, *lateris*, the side, *gradior*, to advance). A family of Spiders, which make no web, but run, crab-like, sideways or backwards, and occasionally throw out adhesive threads to entrap their prey.

LATEX (*lateo*, to be hidden). Any kind of liquor squeezed out. This term denotes, in Botany, a highly elaborated and highly organized juice, which is not formed immediately from the fluid matter absorbed from without. The tissue, in which this juice is found, is termed *laticiferous tissue*, and more recently *cinenchyma*.

LA'TITUDE (*latitudo*, breadth). The *latitude* of a place on the earth's surface is its angular distance from the equator, measured on its own terrestrial meridian; it is reckoned in degrees, minutes, and seconds, from 0 up to 90°, and northwards or southwards according to the hemisphere in which the place lies. Thus the observatory at Greenwich is situated in 51° 28′ 40″ north latitude.

1. *Latitude, parallels of.* Small circles on the earth's surface parallel to the equator. Every point in such a circle has the same latitude. Thus, Greenwich is said to be situated *in the parallel of* 51° 28′ 40″.

2. *Latitude of a star.* The distance of a star from the ecliptic, measured on the great circle passing through the star and the pole of the ecliptic.

LA'TROBITE. A pink-coloured mineral, allied to felspar, found in Amitok island, near the coast of Labrador, and named from Mr. Latrobe.

LAUMONTITE. *Lomonite.* A zeolitic substance, named from Gillet-Laumont. It is also called efflorescent zeolite, because some of its varieties are subject to decomposition on exposure to the air.

LAURACEÆ. The Cinnamon tribe of Dicotyledonous plants. *Leaves* entire, alternate; *flowers* apetalous; *stamens* perigynous; *fruit* baccate or drupaceous; *seeds* without albumen.

LAURINE. An acrid and bitter principle contained in the berry of the laurel.

LA'VA. A general term for the substances emitted from volcanoes, in a fused or fluid state. In its ordinary condition, it differs from basalt chiefly in being porous. It admits, however, of several varieties, which are sufficiently characterized by the terms *compact*, *vesicular*, *slaggy*, and *spumous*.

LAYERING. The process of propagating young plants from a parent stock, by laying down a branch, and then separating it from its parent. See *Malleolus*.

LA'ZULITE. *Lapis lazuli.* A blue mineral from Styria and the Tyrol, which furnishes the valuable pigment known by the name of ultra-marine. It is a silicate of alumina, soda, and lime, and is sometimes confounded with *klaprothite*, or blue spar, which is a phosphate of alumina.

LEAD. A white metal with a blue tinge; the softest of all the durable metals. *White lead*, or *ceruse*, is a white substance produced, in the form of flakes, by the action of the vapour of vinegar on lead. It may be dissolved in acetic acid, forming a crystallizable salt, called *sugar of lead*, from its sweet taste. *Red lead*, or *minium*, is the red oxide of lead, a tasteless powder of an intensely red colour. *Black lead*, or graphite, is a misnomer, being a carburet of iron.

LEAF OF PLANTS. The leaf is an expansion of the bark at the base of a leaf-bud, prior to which it is developed. It consists of a midrib, on each side of which is a parenchymatous expansion, composed of a double stratum of cellular tissue, separated by vessels. A *simple* leaf is that of which the lamina or blade consists of one piece only, whatever may be the depth of its divisions; a *compound* leaf is that of which the cellular tissue is separated into several portions, each forming a complete blade by itself.

LEAF-STALK. *Petiole.* That part of the leaf which connects the blade with the stem. It consists of one or more bundles of fibro-vascular tissue surrounded by cellular substance.

LEAFLET. The designation of each of those small separate leaves, which together compose a compound leaf.

LEAGUE. The twentieth part of a degree of latitude, or three geographical miles, each of which is the sixtieth part of a degree. The French have two kinds of league; the first consisting of 2000 toises, or 2·42 English statute miles; the second of 2·77 English miles, or 25 leagues to the degree; the former is their legal posting measure.

League, Nautical. Seamen measure by *nautical miles*, 60 of which make a degree of latitude, or a degree of longitude at the equator; and three nautical miles make a *nautical league*, which is, accordingly, 3·45 land or statute miles, or *three* miles, *four* tenths, *five* hundredths, which is easily remembered.

LEAP-YEAR. The name given to every fourth year of the Julian calendar, in which one additional day—the 29th of February—is reckoned. The year is so called, because the day of the month, after February, *leaps* over a day of the week. The reason for adding a day every fourth year is, because the *tropical* exceeds the *civil* year by six hours, which excess amounts, in four years, to one day. See *Bissextile.*

LEAST SQUARES, METHOD OF. A method of finding the most probable truth, when a number of discordant observations have been made upon a phenomenon. "If three observations give 93, 94, and 98, then the mean of the three is 95, and if this be assumed as true, it is also assumed that the errors of the observations were 2, 1, and 3. The sum of the squares of these is 4+1+9, or 14, and this is the least possible sum which can be thus obtained. If, for example, we assume any thing but 95, say 95·1, the assumed errors are then 2·1, 1·1, and 2·9, the squares of which are 4·41, 1·21, and 8·41, the sum of which is 14·03, more than 14."—*Pen. Cycl.*

LEAVEN or YEAST. A substance which possesses the power of commencing fermentation in other substances.

LECO'NORIN. A white crystalline substance procured from the *Leconora tartarea* and other lichens, employed in the manufacture of cudbear.

LEE. An epithet to distinguish that half of the horizon to which the wind is directed, from the other part where it arises, which latter is accordingly called to *windward.*

LEE'LITE. A red siliceous stone found at Gryphytta in Westmannia, and named from Mr. Lee of Cambridge.

LEEWARD. The *lee-side* of a ship is that half of a ship (divided lengthways), which is opposite to that on which the wind blows when it crosses her course, and which is called the *weather-side.* All objects on the lee-side are said to be to the *leeward*, and those on the weather-side to the *windward* of the vessel.

bert
Cal

LEEWAY. The angle made by the line on which the ship should run, according to the point of the compass steered upon, and the real line of the ship's way occasioned by contrary winds, rough sea, or the set of a current.

LEGER LINES and SPACES. In Music, the lines and spaces which are added to the staff, when the notes exceed the ordinary compass.

LEGU'MEN (*lego*, to gather). A legume; a one-celled, two-valved, superior fruit, dehiscent by a suture along its face and its back, and bearing seeds on each margin of its ventral suture.

1. *Legumen Lomentaceum.* A lomentum; a fruit differing from a legume in being contracted in the spaces between each seed, and there separating into distinct pieces.

2. *Legumin.* A peculiar principle, found in the fleshy cotyledons of the seeds of papilionaceous plants.

LEGUMINO'SÆ (*legumen*, a legume). The Pea tribe of Dicotyledonous plants. Herbs with *leaves* alternate; *stamens* perigynous, monadelphous, or diadelphous; *ovarium* superior, solitary, simple; *fruit* leguminous; *seeds* without albumen.

LEIDENFROST'S PHENOMENON. If water in minute quantities be placed on a red-hot plate, it will not boil, nor evaporate quickly, but, as the metal begins to cool, the liquid assumes a globular figure, and exhibits a rotatory and oscillating movement, during the continuance of which the process of evaporation is carried on much less rapidly than during ebullition. When the metal has cooled down to a still lower degree, the liquid boils with great violence, and is dispersed in every direction.

LEIOTRICHA'NÆ. Silky chatterers; a sub-family of birds, in the system of Mr. Swainson, belonging to the *Ampelidæ*, or Chatterers, and named from the genus *Leiothrix*.

LEMMA (λῆμμα, any thing taken or received). A proposition introduced merely for the purpose of establishing some more important proposition. Thus, in a treatise on mechanics, if it were necessary to prove certain propositions of geometry, those propositions would be lemmas. In Logic, a lemma is an assumption or premiss taken for granted.

LEMNIAN EARTH. A compound of aluminum, found in the island of Lemnos. It is also called *sphragide* (σφραγὶς, a seal). and *terra sigillata*, from its being cut into pieces, and stamped with a seal. It is similar to Armenian bole.

LEMNI'SCATA (λημνίσκος, a riband). In Geometry, a curve of the fourth degree, having the form of the figure 8, and of which the equation is $x^2 + y^2 = a\sqrt{x^2 - y^2}$. It is the locus of the point in which a tangent to an equilateral hyperbola meets the perpendicular on it drawn from the centre. There are many other curves of the same order with a similar form, but their equations differ from the above.

LEMNI'SCUS. The Latin term for riband; and, hence, applied to the minute riband-shaped appendages of the generative pores in *Entozoa*.

LEMU'RIDÆ. A family of quadrumanous animals, named *lemurs* which supply the place of monkeys in Madagascar and some parts of Africa and India.

LENGTH OF SHELLS. Spiral shells are measured from the tip of the spire to the base, and therefore perpendicularly. The length of bivalves is taken horizontally; thus, the *solens* is the longest shell of this tribe, the length being taken from the anterior to the posterior margin.

LENS (*lens*, a bean). Properly, a small roundish glass, shaped like a *lentil*, or bean. In physics, the term is applied to any transparent medium, the essential character of which is, that it shall refract the rays of light, so that the divergence, or convergence, of those rays shall be equally produced after their passage through the lens.

1. The usual forms and names of lenses are the *convex*, which converges the rays; the *concave*, which disperses them; the *plano-convex*, having one surface plane, and the other convex; the *double convex*, having both sides convex; the *plano-concave*, having one surface plane, and the other concave; the *double concave*, having two concave surfaces; and the *meniscus*, having one side concave, and the other convex.

2. The point where no refraction is produced on perpendicular rays, is called the *axis* of the lens, which is a right line passing through its centre, and perpendicular to both its surfaces. In every beam of light, the middle ray is called its *axis*. Rays of light are said to fall *directly* upon a lens, when their axes coincide with the axis of the lens; otherwise they are said to fall *obliquely*. The point at which the rays of the sun are collected, by passing through a lens, is called the *principal focus* of that lens.

3. *Lens, Coddington.* A well-known lens, consisting of a sphere of glass divided into two portions by a deeply cut circular groove, which is filled up with opaque matter. The lens of the cuttlefish is a precisely similar instrument.

LENTICE'LLÆ. Lenticular glands, or brown oval spots found upon the bark of many plants, especially willows. They are considered by De Candolle to bear the same relation to roots as buds bear to young branches.

LENTI'CULAR (*lenticula*, a little

lens). Lens-shaped; small, depressed, and doubly-convex, as the seed of amaranth.

LENTIL-ORE. An arseniate of copper, also called the *lenticular* arseniate.

LE'NZINITE. A silicate of alumina, found at Eifeld in Prussia, and distinguished into the *opaline* and the *argillaceous* varieties.

LEO WITH COMA BERENICES. The fifth of the zodiacal constellations, containing 95 stars, of which Regulus is the principal. It indicates the second month of winter, and extends from the 20th of January to the 20th of February. In Egypt the earth assumes its most beautiful aspect in the month of February; a part of the harvest is already begun. The king of animals was chosen to typify the strength and the magnificence of nature at this period.

LEO MINOR. A modern northern constellation, containing fifty-three stars.

LE'PADITES. A designation of the reputed bivalvular opercula of ammonites, found at Solenhofen, and also termed trigonellites, solenites, and aptychus.

LE'PADOIDS. A group of Cirrhopods, named from the typical genus *lepas*, and commonly known by the name of barnacles. They are distinguished by their pedunculated character from the other group, or balanoids, which are sessile.

LEPIDODE'NDRON (*λεπὶς, λεπίδος*, a scale, *δενδρὸν*, a tree). A genus of fossil plants of the coal measures, intermediate in character between the Lycopodiums and coniferous plants; they appear, from their great abundance, to have contributed in large proportion to the solid matter of coal. The name is derived from the trunk of the tree being marked along its whole length with scales or scars.

LE'PIDOLITE (*λεπὶς*, a scale, *λίθος*, a stone). A name for several beautiful, variously-coloured, scaly varieties of *lithia-mica*, some of which are, however, referable to the silicates combined with fluorides. They are found at Ròzna in Moravia, and other places.

LEPIDO'PTERA (*λεπὶς, λεπίδος*, a scale, *πτερὸν*, a wing). An order of insects which have four membranous and scaly wings, and undergo complete metamorphosis, as the butterfly, the moth, &c. All the *Caterpillars* are the larvæ of lepidopterous insects.

LE'PIDOTE (*λεπὶς*, a scale). Leprous; covered with minute peltate scales, as the leaf of elæagnus.

LEPI'SMADÆ. A family of wingless insects, belonging to the order Thysanoura, in which the abdomen is terminated by long jointed bristles, as in the sugar-louse.

LE'PORIDÆ (*lepus*, a hare). The Hare tribe; a family of the *Rodentia*, distinguished from all the other families by the presence of two small incisors behind the rodent teeth. The hare is a ruminating animal, though destitute of the complex stomach of the ruminantia.

LE'PTIDES. A sub-family of dipterous insects, of the family Brachystoma, named from the genus *leptis*.

LEPTOPHI'NA. A sub-family of serpents, belonging to the family Colubridæ, and comprising the genera *leptophis* and dryinus.

LEPUS. The Hare, a southern constellation, containing nineteen stars.

LERNÆIFO'RMES. An order of the edentulous crustaceans, in which the extremities are but little developed, and the body presents great variety of form.

LETTERS FOR STARS. Towards the end of the sixteenth century, Bayer published the first charts in which the stars were not only constellated, but distinguished in their constellations by *letters*. Beginning with the Greek alphabet, he put *α* to the star which he considered brightest, *β* to that which was next in brightness, and so on throughout the constellation, using the Roman letters when the Greek were exhausted. His successors added more letters, frequently going through both the Greek alphabet and the Roman, where Bayer had exhausted only a part of the Greek, and sometimes even adding another alphabet of capital Roman letters.

LEUCIN (*λευκὸς*, white). A peculiar white principle obtained from muscle. Nitric acid converts it into a crystallizable acid, called *nitro-leucic*.

LEU'CITE (*λευκὸς*, white). *Amphigen*. A mineral allied to felspar, found chiefly at Vesuvius, in separate crystals of various sizes and degrees of transparency, massive, embedded in pyroxenic and other lavas.

LEUCOL. A particular substance produced in the distillation of coal.

LEU'TTRITE. A greyish-white mineral found at Leuttra, near Jena in Saxony. It appears to be a recomposed rock, analogous to some of the sandy varieties of domite.

LEVEL. Two points on the surface of the earth are said to be on the same *level*, where they are equally distant from the earth's centre. A level surface, therefore, is not a plane, but a portion of a spherical surface; and this is the form which a sheet of water, or any other liquid, naturally assumes.

Horizontal and dead level. There are various instruments used in *levelling*, which are called *levels*. These all give a *horizontal level*, that is, a tangent to the earth's surface; and in the case of a *drain* or *canal*, the bottom of the excavation must be carried lower than the level indicates, otherwise the water would not run. The declivity must be in a circle equivalent to that of the earth's circumference before the water could reach it, and this would then be termed a *dead level*.

LE'VER (*levo*, to raise). A *physical* or *compound* lever is any inflexible rod or solid body whatever, supported on one point, and acted on at two other points, by two forces tending to move it in opposite directions about the point of support. The two forces acting on the lever are called the *power* and the *weight*, and the point on which the lever is supported, or about which it turns, is called the *fulcrum*. The power of this instrument depends on the proportion between the lengths of the parts of the lever on each side of the fulcrum.

1. *Lever, one, or two-armed.* 1. In the *one-armed* lever, the power and the weight are both on one side of the fulcrum, as in the common wheel-barrow. 2. In the *two-armed* lever, the fulcrum is between the power and the weight, being either equidistant from the two forces, or nearer to one of the forces than to the other.

2. *Levers* are *rectilinear* or *curvilinear*, according as their arms are straight or curved lines. A lever is *angular*, when the arms form an angle, in which case the fulcrum is at the vertex of the angle.

3. *Lever, Universal.* An instrument constructed by combining the lever with the wheel and axle; its object is to give a continued rectilinear motion to a heavy body, by means of the reciprocating motion of the lever.

LEVIGATION (*lævigo*, to polish; from *lævis*, smooth). The process of rubbing earths and some metallic substances with a *muller* upon a flat table of hard stone. Some fluid is added to assist the operation, and in this respect it differs from trituration.

LE'VINE. A scarce zeolitic substance, occurring in the cavities of an amygdaloid rock, at Dalsnypen in Faroe.

LEY. *Lixivium.* A technical term for a solution of alkali in water.

LEYDEN JAR. An apparatus for accumulating and condensing electricity, constructed on the principle that the opposite electricities may be held in a latent state. It consists of a cylindrical glass-jar coated to a certain height, inside and outside, with tinfoil, so that every point of both sides of the glass may be brought into communication at the same moment. To convey the fluid to the interior of the jar, a brass wire runs through its lid, the upper end terminating in a ball, and the lower end, divided into several fine points, touches the foil within the jar. A combination of such jars is called an *electrical battery.*

LHE'RZOLITE. A mineral consisting of coccolite mixed with serpentine.

LIAS. A subdivision of the Oolitic or Jurassic system of Geology, consisting of a great argillaceous deposit with some thick arenaceous bands, and many concretions and beds of argillaceous limestone. It is continued without interruption from the coast of Dorsetshire to the north-east coast of Yorkshire. The term *lias* is supposed to be derived from the appearance of the bed in riband-like *layers* of different colours, observed in some parts of England.

LIBELLU'LIDÆ (*libellula*, the dragon-fly). A group of neuropterous insects, which are aquatic in their preparatory states, and emerge from the water at the period of their final metamorphosis.

LIBER. The inner bark of a tree, used instead of paper by the ancients to write upon. In botanical language, it denotes the interior fibrous portion of the bark, lying immediately upon the alburnum; the *endophlœum* of later writers. See *Bark*.

LIBRA. The Balance; the seventh of the zodiacal constellations, consisting of fifty-one stars, the principal of which is Zubenich Meli. It denotes the first month of spring, and extends from the 20th of March to the 20th of April. This month answers to the vernal equinox and the equality, or *balance*, of the days and nights.

LIBRA'TION (*libro*, to balance). A slight swaying motion, like that of a balance. The expression is applied by astronomers to an apparent oscillation of the moon, in consequence of which she exhibits sometimes a little more, sometimes a little less, of one side or the other.

1. *Libration in Longitude.* The phenomenon by which the moon, during the period of acceleration, exhibits on the east some portion of her surface not previously seen, whilst corresponding parts disappear on the west. The converse of this takes place during retardation.

2. *Libration in Latitude.* The phenomenon by which the moon, in consequence of her axis of rotation being inclined to her orbit, and of its always preserving its parallelism, turns each of her poles to us alternately, and displays to us the spots situated about it.

3. *Diurnal Libration.* The phenomenon by which the moon, when on the horizon, presents some parts the more of one side, and a corresponding portion the less of the other side. This is in consequence of the spectator being removed from the centre of the earth (towards which the same hemisphere of the moon is constantly turned) by the length of the earth's radius.

LICHE'NES. The Lichen tribe of the Aphyllæ, or leafless plants. Aerial, *leafless,* perennial plants, spreading over almost all dry surfaces, of trees, stones, &c.; *reproductive organs* are *sporules* lying in thecæ in the medullary substance, or separated *cellules* of the medullary layer of the thallus.

LI'CHENIN. Lichen starch; a peculiar vegetable product, obtained from the *cetraria islandica,* or liverwort; it is said to combine, like the alkalies, with acids, but it does not form crystallizable salts with them.

LICHTENBERG'S FIGURES. The phenomena observed on discharging a positive spark and a negative spark on different parts of the same polished resinous surface; the two electricities will be retained, in a latent state, on their respective spots. If the surface be now sprinkled with flowers of sulphur, the powder will be attracted and retained by the electricities; and, if the rest of the powder be blown away, a radiant star-like figure will be found at the positively electrified spot, and a round clouded speck at the spot which was negatively electrified.

LIE'VRITE. A pyroxenic mineral, also called *ilvaite* and *yenite,* occurring in particularly perfect crystals, chiefly from Elba.

LI'GAMENT (*ligo,* to bind). An external substance, by which the two valves of acephalous testacea are united, and which, in fact, is the true hinge. The internal part is generally composed of another substance, and is called the cartilage.

LIGHT. The agent of vision, or the cause of those sensations and colours which we refer to the eye, or sense of seeing, as their source. It is distinguished into two kinds; viz. *natural* light, proceeding from the sun and stars; and *artificial* light, proceeding from bodies which are strongly heated, and thus become incandescent.

1. A *ray* is a single line of light, as it comes from a luminous body. A *beam* of light is a body of parallel rays. A *pencil* of light is a body of diverging or converging rays. *Divergent* rays are such as come from a point, and continually separate wider apart, as they proceed. *Convergent* rays are those which approach each other, so as to meet at a common point. *Luminous* bodies emit rays, or pencils of light, in every direction, so that the space through which they are visible is filled with them at every possible point.

2. *Light barometrical.* A luminous appearance exhibited in the vacuum of some barometers, when the mercury is shaken in the dark—a phenomenon probably depending on electricity.

LIGHT-EQUATION. Roemer observed that the eclipses of the satellites of Jupiter, which occurred at and about the opposition of the planet, or its nearest point to the earth, took place *too soon* for his calculation; whereas those which happened when the earth was in the part of its orbit most remote from Jupiter, were always *too late.* The correction required in consequence of the time employed by light in traversing the solar system, is called the *light-equation.*

LIGHTNING. A phenomenon usually referred to the accumulation of sensible electricity in the atmosphere, and its consequent neutralization: a strong electric spark traverses a stratum of air intervening between oppositely electrified clouds, or between a cloud and the earth's surface. See *Conductors Metallic.*

LI'GNIN (*lignum,* wood). The basis of woody fibre—the most durable product of vegetation. When heated in close vessels, it yields *pyro-ligneous acid;* and a peculiar spirituous liquor is produced, called *pyro-xylic spirit.*

LIGNIPE'RDOUS (*lignum*, wood, *perdo*, to destroy). A term applied to insects which destroy wood.

LI'GNITE (*lignum*, wood). A variety of coal, of a brown, dull, compact, or laminated appearance, often woody, burning with flame and smoke.

LI'GNONE (*lignum*, wood). *Xylite.* A liquid which exists in commercial pyroxylic spirit,—a product of the distillation of wood.

LI'GNUM. Wood; that portion of arborescent plants which comprises the *alburnum* and the *duramen.*

LI'GULA. A peculiar membranous process at the top of the sheath in grasses, between the sheath and the blade.

LI'GULATE FLOWERS (*ligula*, a strap). Strap-shaped flowers, or those which have a gamopetalous corolla slit on one side, and opened flat, as in many of the composite plants.

LI'GURITE. A silicate of alumina, lime, and magnesia, found in a talcose rock on the banks of the Stura in the Apennines. It is reckoned superior to the chrysolite as a gem, in colour, hardness, and transparency.

LILIA'CEÆ. The Lily tribe of Monocotyledonous plants. Bulbous, tuberous, creeping, or arborescent plants; *calyx* and *corolla* inferior, coloured, regular; *stamens* 6; anthers opening inward; *fruit* 3-celled.

LILY ENCRINITE. A radiated animal occurring in the seas of the new red sandstone, enclosed within a stony habitation, said to consist of nearly thirty thousand separate pieces, and planted upon a stony but moveable column, nearly cylindrical, and attached at its base to the solid rock. See *Encrinites.*

LIMACI'NÆ. Slugs; a sub-family of the *Helicidæ*, named from the genus *limax*, and having either no shell, or one much too small to contain the body.

LIMB. A term applied to the curved edge of a circle, as the graduated *limb* of a quadrant. In Astronomy, it denotes the outermost border of the sun or moon; thus, it is usual to speak of the moon's lower or upper *limb*, and even of her eastern or western *limb;* and especially, in the case of an eclipse, when a portion of her disc is obscured.

LI'MBILITE. A compact mineral, found in the form of irregular grains in the volcanic hill of Limbourg.

LIME. The oxide of calcium; an alkaline earth, found as a carbonate in marble, chalk, and limestone. These substances become lime, when burned in a white heat. *Quick lime* is limestone which has been burned, and acquired new properties. *Slaked lime* is the powder produced by pouring water upon quicklime; this is a hydrate, and, when diffused through water, yields the substance called *milk* or *cream of lime.*

LIMESTONE. A designation of the various modifications of calcareous rocks, consisting of carbonate of lime. The principal kinds are the *primary* or crystalline, the *secondary* or compact, the *oolite*, *chalk*, &c. *Saccharine* limestone is a term applied to a few small beds occurring in the inferior stratified series of rocks, from its resemblance to refined sugar; it is sometimes called *primitive* limestone, from the period of its occurrence in this series.

LIMIT (*limito*, to bound). A boundary. But the term *limit* is employed in the sciences in a wider sense. There are certain effects in Natural Philosophy, as well as quantities in Mathematics, which cannot be determined with accuracy; but, in many of these cases, we may fix a *point* which that *effect* or *quantity* must certainly exceed, and another at which it cannot possibly arrive. These *points* are the *limits* of the problem. Thus,

1. We cannot predict the exact height at which the mercury will stand, at the level of the sea, in a barometer, on any future day; but we may assert, from past experience, that it will be somewhere between twenty-eight and thirty-one inches. So also,

2. We cannot determine exactly the length of the circumference of a circle; but we are certain that it is greater than that of any inscribed polygon, and less than that of any circumscribed one, however numerous their sides may be.

LIMNACI'NÆ. River-snails; a sub-family of the *Helicinæ*, named from the genus *limnea*, and having only two depressed or flattened tentacula, and no operculum.

LIMNÆ'IDÆ (λίμνη, a marsh). A family of fresh-water testaceous mollusca, consisting of the genera *limnæa*, physa, and planorbis. Lamarck defines them as amphibian trachelipods, generally inoperculate, with flattened tentacula, and a spirivalve shell.

LINA'CEÆ. The Flax tribe of dicotyledonous plants. Herbaceous plants, with *leaves* usually alternate; *flowers* symmetrical, polypetalous; *stamens* hypogynous; *ovarium* entire, many-celled; *seeds* compressed and inverted.

LINE. Euclid defines a mathematical line as that which has "length without breadth." This, however, is a pure abstraction, and can be only *mentally* conceived by the aid of another abstraction: thus, if a mathematical *point* be imagined to move in space, and to mark its course by a trace or track, this trace or track will be a mathematical *line*. Such a line is the boundary of a surface, having length only. A *right line*, or straight line, is that which lies evenly between its extreme points. Any line of which no part is a right line, is called a *curve*.

LINEAR EQUATION. An equation of the first degree; in other words, an equation connected with straight lines.

LINNÆ'AN SYSTEM. A method of classifying plants, introduced by Linnæus, and founded on modifications of the sexual apparatus. See *Botany*.

LIPS OF SHELLS. The two sides of the aperture of spiral shells are termed the *lips*. That which joins, and generally folds over, the lower part of the columella, is called the *inner* lip, while that part of the circumference which is opposite is the *outer*. The latter, of course, is found in all shells, because it is the termination of the last whorl; but the former is frequently absent, or indicated merely by a thin, whitish, almost transparent enamel.

LIQUA'TION (*liquo*, to melt). *Eliquation*. An old process for separating silver from copper. During reduction, the silver is mixed with lead, which has little affinity for the copper, but combines readily with the silver; the lead is then separated from the silver by cupellation.

LIQUEFACTION (*liquefacio*, to melt). The passing of a substance from the solid to the liquid state—one of the effects of caloric. The term is sometimes synonymous with *fusion*, with *deliquescence*, and with *solution*.

LIQUID (*liqueo*, to melt). An inelastic fluid, the particles of which move on each other, and yield to the slightest impression. All liquids may be arranged into two great classes, viz. *simple* liquids, as mercury, and *compound* liquids, as combined gases, &c.

LI'THARGE (λίθος, a stone, ἄργυρος, silver). A semi-crystalline protoxide of lead, obtained in the process of separating silver from lead ores. Litharge is more or less white or red according to the metals with which the silver is alloyed, the white being called *litharge of silver*, the red *litharge of gold*.

LI'THIA (λίθος, a stone). The protoxide of lithium; an alkaline oxide existing in certain minerals, and in the waters of Carlsbad, in combination. Its name is derived from its occurring only in the mineral kingdom.

LITHIC ACID (λίθος, a stone). *Uric acid*. A principle constantly present in healthy urine, and generated by the action of the kidneys.

LI'THIUM (λίθος, a stone). A metal first found in the minerals petalite and spodumene, and more recently in amblygonite and lepidolite, where it exists in combination with silica.

LITHO'DOMI (λίθος, a stone, δέμω, to build). Molluscous animals which form holes in solid rocks, in which they lodge themselves. The holes are not perforated mechanically, but the rock appears to be dissolved.

LITHO'GENOUS (λίθος, a stone, γεννάω, to form). A term applied to polyps which form coral.

LITHOGRAPHIC STONE (λίθος, a stone, γράφω, to write). A slaty compact limestone, of a yellowish colour and fine grain, used in lithography.

LITHOI'DAL (λίθος, a stone, εἶδος, likeness). Having a structure resembling stone.

LITHOLO'GICAL (λίθος, a stone, λόγος, an account). A term denoting the stony structure or character of a mineral mass. The *lithological* character of a stratum is distinguished, in the language of geology, from its *zoological* character.

LI'THOMARGE. *Steinmarck*. Stone-marrow, a mineral which has been associated with steatite, although most of its varieties are silicates of alumina; the more remarkable of which are, that of a reddish-yellow colour in porphyry, from Rochlitz, and the fine purplish-blue variety from Planitz, formerly called terra miraculosa Saxonica, &c.

LITHO'PHAGI (λίθος, a stone, φάγω, to eat). Molluscous animals which form holes in solid stones. See *Lithodomi*.

LITHOPHA'GIDÆ (λίθος, a stone, φάγω, to eat). A general designation of those *conchiferous* and other animals, which perforate stones or corals, forming therein a nidus, or shallow basin-like lodgment for themselves.

LITHO'PHYTA (λίθος, a stone, φυτὸν, a plant). A designation of those polyps which have a stony axis, as distinguished from the *keratophyta*, or horny polyps.

LITMUS. *Turnsol.* A blue pigment obtained from the Lichen orcella, and employed by chemists for detecting the presence of an uncombined acid. *Litmus paper* is prepared by digesting powdered litmus in water, and painting with it white paper which is free from alum.

LI'TUUS. The name given to a spiral thus described:—Let a variable circular sector always have its centre at one fixed point, and one of its terminal radii in a given direction. Let the area of the sector always remain the same; then the extremity of the other terminal radius describes the lituus. The polar equation of this spiral is $r^2 \theta = a$.—*Pen. Cycl.*

LIVER-ORE. *Hepatic mercurial ore.* A mixture of cinnabar with bituminous and earthy particles, from Idria, compact and slaty.

LIVER-PYRITES. Sulphuret of iron, of a radiated texture; distinct from the *fer sulphuré hépatique* of some French mineralogists, which consists of both radiated and common iron-pyrites converted into brown iron-stone.

LIXIVIA'TION (*lixivium*, a ley). The application of water to a saline body which consists of both soluble and insoluble ingredients. The solution obtained is the *lixivium*, or ley,—a term used by the older chemists to signify a solution of an alkali in water; what is now called an alkaline solution, being formerly called an alkaline lixivium or ley.

LLANDEILO FLAGS. The name of one of the Lower Silurian Rocks, consisting of a bed, 1200 feet in thickness, of hard, dark-coloured, slaty sandstones, frequently calcareous, sometimes slightly micaceous, containing mollusca and trilobites.

LOADSTONE. An ore of iron which possesses the peculiar properties of attracting iron, and of turning towards the north pole, when freely suspended. M. Haüy observes, that the ores in which the iron contains the least oxygen independently of other combinations, form *natural magnets;* and he terms the *loadstones* of commerce, found in different parts of the world, *oxidulated iron.* The properties of the natural loadstone may be communicated to iron and steel, which, when properly prepared and touched by the loadstone, are called *artificial magnets.* See *Magnet.*

LOAM. A soil consisting chiefly of clay, silicious sand, and chalk, or carbonate of lime. The quality of a loamy soil varies considerably with the relative proportions of these constituents.

LOAM or BRICK CLAY. A variety of clay of variable appearance, its colour depending on the proportion of oxide of iron which it contains. It lies upon the London clay, and contains a few organic remains, sometimes the teeth of the elephant. The *Hedgerley loam*, found near Windsor, is used in making lutes, &c.

LOBELIA'CEÆ. The Lobelia tribe of dicotyledonous plants. Herbaceous plants or shrubs, with *leaves* alternate; *flowers* axillary or terminal; *stamens* syngenesious; *ovary* inferior; *fruit* capsular.

LO'BOITE. A magnesian *idocrase* occurring in Norway.

LOCOMO'TIVE (*locus*, place, *moveo*, to move). A term generally expressive of motion attended by a *change of place*, and thus opposed to *stationary:* thus, a locomotive power, or engine, is any power or engine employed for transport, which travels with the load it draws.

LOCULICI'DAL (*loculus*, a cell, *cædo*, to cut). That mode of *dehiscence* of fruits, in which the loculi, or cells, are severed at their backs, as in lilac. The older botanists described it as dehiscence with the valves opposite to the dissepiments.

LO'CUS. The Latin word for a *place.* In geometrical analysis, it denotes a line or surface traversed by a point which varies its position according to some determinate law. 1. The *locus* of the vertex of an isosceles triangle described upon a given base, is the straight line which bisects the base at right angles. 2. The *locus* of the vertex of a triangle which has a given base and a given area, is a pair of straight lines parallel to, but on different sides of, the base. 3. The *locus* of the vertex of a triangle which has a given base and a given vertical angle, and which lies on a given side of the base, is an arc of a circle of which the given base is the chord.

1. *Plane and Solid Loci.* When the locus of the variable point is a straight line or a circle, it was called by the ancient geometers a *plane locus;* when one of the conic sections, a *solid locus.*

2. *Orders of Loci.* Loci are distinguished into orders or degrees, according to the dimensions of the algebraic equations by which they are represented.

The loci of all equations of the second degree are conic sections or circles.

LOCU'STA. In Botany, a spikelet, or the partial inflorescence of certain grasses, as the brome and the wheat. This term is also applied to those other inflorescences, in which the flowers are sessile, and arranged upon a lengthened axis, which is permanent; it is thus distinguished from the *catkin*, which is deciduous.

LOCU'STIC ACID. An acid procured from the *locusta*, or grasshopper, differing little from acetic acid.

LOCU'STIDÆ (*locusta*, a locust). The Locust tribe; a group of Orthopterous insects, belonging to the class *Saltatoria*, remarkable for their migratory habits and devastating powers.

LODE. A technical term for a metallic or mineral vein. *Live* lodes are those which contain metallic ores; *dead* lodes, those which contain only stony matters.

LOESS, or LÖSS. A German designation of a peculiar loamy deposit in the valley of the Rhine, occurring in patches between Cologne and Basle. The term is sometimes applied in this country to a peculiar yellow loam with calcareous concretions.

LOG and LOG-LINE. The *Log*, in sea-language, is the name of a piece of wood in the form of the sector (usually a quadrant) of a circle of five or six inches radius. It is about a quarter of an inch thick, and so balanced by means of a plate of lead nailed upon the circular part, as to swim perpendicularly in the water with about two-thirds immersed under the surface. The *Log-line* is a small cord of about one hundred fathoms in length, one end of which is fastened (by means of two legs) to the centre and to the arched part of the *Log*, while the other is wound round a reel in the gallery of the ship. The Log thus poised keeps its place in the water while the line is unwound from the reel by the ship's sailing; and the length of line unwound in a given time gives the rate of the ship's course. This is calculated by *knots* made on the line at between forty and fifty feet distance, while the time is measured by a sand-glass of a certain number of seconds. The length between the knots is so proportioned to the time of the glass, that the number of knots unwound shows the number of miles which the ship is sailing in the hour.

LO'GARITHM (λόγος, a ratio, ἄριθμος, number). Logarithms are a series of numbers adapted in a certain way to a series of natural numbers, to facilitate the processes of numerical computation. A simple idea of this system may be acquired by taking a set of numbers, as 1, 2, 3, 4, 5, 6, having for their common difference the first number of the series; and placing under them another set of numbers, which proceed by continued multiplication by the first number of the series, as 2, 4, 8, 16, 32, 64. The former set are the *logarithms* of the latter, which are called *natural numbers*. Thus,

1, 2, 3, 4, 5, 6, &c.
2, 4, 8, 16, 32, 64, &c.

1. If now we add together any two of the upper set, and note the number beneath their sum in the lower set, this number represents the product arising from multiplying together the numbers of the lower set corresponding with the numbers of the upper set which were added together. Thus, on adding 2 to 4, we have 6 in the upper set, beneath which is 64; and this is the product of 4 and 16 in the lower set, opposite to 2 and 4 in the upper. So that, *instead of multiplying the natural numbers, we add their logarithms together*, and at once find the product.

2. In like manner, if we subtract one of the upper numbers from another, and note the number beneath their difference in the lower set, this number represents the quotient arising from the division of one of the lower numbers by another, both corresponding with the upper numbers which were subjected to the process of subtraction. Thus, on subtracting 4 from 6, we have 2 in the upper set, beneath which is 4; and this is the quotient arising from the division of 64 (the number beneath 6) by 16 (the number beneath 4). So that, *instead of dividing the natural numbers, we subtract their logarithms*, and at once find the quotient.

3. By the aid of *logarithmic tables*, time and labour are saved to an extraordinary degree. Supposing, for instance, we had to multiply a number, consisting of seven figures by itself, and this product again by the original number, we shall have to multiply seven places of figures by an equally large number, and then fourteen places of figures by seven places, till at last we reach a product of twenty-one places. But, by the aid of logarithms, we have only to take three times the logarithm of the original number, and that gives the logarithm of the

last product of the 21 places of figures, without any further multiplication.

4. The *index* or *characteristic* of the logarithm of a number is *one less* than the number of integral figures of the number. Thus, if the number contain *five* integral figures, the index is 4; if it contain *four*, the index is 3; and so on. When the number has no integral figures, the index of its logarithm is *negative*, and is *one more* than the number of ciphers immediately after the decimal place; that is, the number of *prefixed* ciphers. Thus, if there is no cipher after the decimal, the index is —1; if there is one prefixed cipher, the index is —2; and so on. The negative sign is placed over the index, thus: $\overline{1}$, $\overline{2}$, &c.

5. The *logarithm of a number to a given base* is the quantity expressing the power to which the base must be raised to become equal to the number.

6. *Logarithmic Curve and Logarithmic Spiral.* "The former has for its rectangular equation $y = a^x$, and its most remarkable property is that its subtangent is the same at every point of the curve. The latter has $r = ca^\theta$ for its polar equation, and its tangent always makes the same angle with its radius vector; whence it is called the equiangular spiral."—*Pen. Cycl.*

LOGIC (λογική τέχνη, the art of reasoning). Logic, in its most extensive application, is the science, as well as the art, of reasoning. So far as it institutes an analysis of the process of the mind in reasoning, it is strictly a *science;* while, so far as it investigates the principles on which argumentation is conducted, and furnishes rules to secure the mind from error in its deductions, it may be called the *art* of reasoning.—*Whately.*

LONDON CLAY. An extensive deposit of a bluish clay, except near the surface, where it has the usual appearance of clay. It abounds in Middlesex, Essex, Suffolk, and part of Norfolk. It occasionally includes beds of sandstone, and of a coarse argillaceous limestone, from which Parker's Roman cement is made. It contains also the bones of the crocodile, the turtle, &c.

LONGICO'RNES (*longus*, long, *cornu*, a horn). A family of the tetramerous *Coleoptera*, characterized by the great development of the antennæ, which are often longer than the body of the animal.

LONGIPE'NNES (*longus*, long, *penna*, a feather). A family of long-winged oceanic birds, comprising the albatross, the petrel, &c.

LONGITUDE (*longitudo*, length). 1. The longitude of a heavenly body is measured on an arc of the ecliptic, intercepted between the vernal equinoctial point and a great circle passing through the body, and perpendicular to the ecliptic. 2. The longitude of a place on the earth's surface is the inclination of its meridian to that of some fixed station referred to as a point to reckon from. English astronomers and geographers use the observatory at Greenwich for this station; foreigners, the principal observatories of their respective nations. The terms *longitude* and *latitude* were employed in Geography from an idea of the ancients that the earth was longer from east to west than from north to south; the former dimension was called its *length*, the latter its *breadth*.

1. *Proposed Change of Expression.* As *latitude* is reckoned north or south, so *longitude* is usually said to be reckoned west or east. "It would add greatly, however, to systematic regularity, and tend much to avoid confusion and ambiguity in computations, were this mode of expression abandoned, and longitudes reckoned invariably *westward* from their origin round the whole circle from 0 to 360°. Thus, the longitude of Paris is, in common parlance, either 2° 20′ 22″ east, or 357° 39′ 38″ west of Greenwich. But the latter is its proper designation." —*Herschel.*

2. *Longitude in Time.* Longitude is reckoned in time at the rate of 24 hours for 360°, or 15° per hour. Thus the longitude of Paris is 23h. 50m. 38½s. Hence, by *longitude in time* is denoted the difference in time in which two places, situated east and west of each other, see the same heavenly bodies: a place 15° east of us sees the sun and stars an hour earlier than we do; at the same distance west, an hour later.

LONGITU'DINAL (*longitudo*, length). Lengthwise; that which has a perpendicular direction from the apex to the base of a body, as contradistinguished from the term "transverse," which denotes a direction across its breadth.

LONGITUDINAL VALLEYS. The name given by Saussure to the great valleys which separate the mountain-chains, and give passage to rivers, as that of the Danube, those of the Rhine and the Rhone, &c.

LOOKING-GLASSES. Plain mirrors

of glass, which, being impervious to the light, reflect the images of things placed before them.

LO'PHIODON (λόφος, a crest, ὀδοὺς, a tooth). A genus of extinct pachyderms, allied to the tapir, and named from eminences of the teeth. They are known only by imperfect fragments.

LOPHOBRA'NCHII (λόφος, a crest or tuft, βράγχια, gills). An order of Fishes, in which the gills, instead of hanging in regular fringes, like the teeth of a comb, from the branchial arches, are disposed in *tufts*, as in the pipe-fish, &c.

LORI'CA. Literally, a coat of mail. A kind of lute, with which vessels are coated before they are exposed to the fire. Hence the term *lorication* in chemistry, for coating. See *Lute.*

LORICA'TA (*lorica*, a coat of mail). 1. An order of *Reptiles*, including the crocodiles, alligators, and gavials, intermediate between the fresh-water tortoises, and the true lizards, and characterized by the plate-armour with which their body is protected. 2. Also, a group of polygastric animalcules, enclosed in a shell, and thus distinguished from the group termed *nuda*, in which the body is entirely soft.

LOWER GREENSAND. The geological designation of the early deposits of the Cretaceous Period, consisting, in England, principally of sand, varied occasionally by calcareous and muddy bands; but on the Continent including many beds of limestone. See *Neocomian.*

LO'XIADÆ. The Cross-bill tribe; a family of the *Insessores*, or Perching birds, named from the genus *loxia*, and characterized by the strong curvature of the mandibles, which is carried to such an extent that the extremities pass over each other. See *Conirostres.*

LOXODRO'MIC CURVE (λοξὸς, oblique, δρόμος, a course). A term applied to a curve of a very peculiar nature, commonly called, in Navigation, the *oblique rhumb line.* It is a spiral, and has the remarkable property of winding round and round the pole of the earth, constantly approaching, yet never reaching it; so that, if a ship could sail on the same oblique course for ever, she would approach infinitely near either to the north or the south pole, but could never actually reach them. See *Rhumb Line.*

LUCERNI'NÆ. Land Volutes, or Lamp snails; a sub-family of the *Helicidæ*, named from the genus *lucerna*, and having an orbicular, depressed, or flattened shell, with the aperture furnished with distinct teeth.

LUCU'LLITE. A sub-species of limestone, of which there are three kinds, the compact, the prismatic, and the foliated. The name was derived from the consul Lucullus. It is the *Nero antico* of the Italians.

LUDLOW ROCKS. A portion of the Upper Silurian rocks, 2000 feet in thickness, composed of three groups:—1. The *Lower Ludlow Rock*, or Mudstone, consisting of sandy, dark-coloured shales and flags, with concretions of earthy limestone, and containing marine mollusca, corals, and fishes; 2. The *Aymestry Limestone,* grey or bluish argillaceous limestone, full of remains of shells and corals; and, 3. The *Upper Ludlow Rock*, thin, grey, slightly micaceous sandstones and shales, containing shells and trilobites.

LUMACHE'LLA, CARINTHIAN. Fire marble; a variety of shell limestone, much esteemed for ornamental purposes.

LUMIE'RE CENDRE'E. The *ashy light;* a term applied by the French to the feeble lustre observable on the unilluminated portion of the moon, arising from the light reflected upon her from the earth. It is popularly called, in this country, *the old moon in the new moon's arms.*

LUNA. The Moon; the satellite of the Earth, being the fiftieth part of the bulk of this planet, and 230,000 miles distant from it. She revolves round the earth in 29 days, 12 hours, 44 minutes, 2 seconds, turning upon her own axis precisely in the same time as she takes to revolve round the earth.

LUNA CORNEA. Horn silver; the chloride of silver, so named from its horn-like appearance and consistence. *Luna* was the alchemical name for silver.

LUNAR DISTANCE. In nautical astronomy, the distance of the moon from the sun, a fixed star, or a planet; by determining this, the longitude of the ship is found.

LUNATE (*luna*, the moon). Presenting the form of a crescent or half-moon, as the muscular impressions of most bivalves.

LUNA'TION (*luna*, the moon). The interval from one new moon to another. This is the original *month*, but, to avoid confusing it with the arbitrary months of the calendar, it is generally called *a lunation.*

LUNE (*luna*, the moon). *Lunule.* The spherical surface included between two semicircles; or, the figure described on a sphere or on a plane by two arcs of circles which enclose a space.

LU'NULITES (*lunula*, a little moon, λίθος, a stone). A genus of fossil *cellariadæ*, consisting of animals (unknown) contained in cellules, and arranged in single tiers, so as to form orbicular polyparia.

LUPUS. The Wolf; a southern constellation, consisting of twenty-four stars, and represented in maps as a wolf transfixed by the spear of the Centaur. It is situated directly beneath Scorpius.

LUSTRE of ROCKS. This is one of the distinguishing characters of rocks. According to Mac Culloch, the highest degree of lustre is the *plumbaginous*, or that of graphite or black lead, which is seen in some clay-slates. The other extreme is that of chalk, which is *dull*, or almost destitute of lustre. The principal intermediate kinds are the *silky, resinous, vitreous, flinty*, and *waxy.*

LUTE. A compound paste, made of clay, sand, &c., for closing retorts and receivers, in order to render them airtight.

LYCOPODIA'CEÆ. The Club-moss tribe of flowerless plants, characterized by their creeping stems, the axis abounding in annular ducts. *Reproductive organs* are axillary sessile thecæ, containing either minute powdery matter, or sporules marked at the apex with three minute ridges.

LYCO'PODITES. A general term for those fossil plants which correspond in some of their characters with some of the genera composing the Lycopodiaceæ.

LYDIAN STONE. Flinty slate; a kind of quartz or flint, allied to hornstone, but of a greyish black colour.

LYE or LEY. A solution of potass, or other alkaline substance, used in the arts. See *Lixiviation.*

LYMPH (*lympha*, water). A colourless liquid which moistens the surface of cellular membrane. The *lymph of plants* is the unelaborated sap, so called from its resemblance to water.

M

MAASTRICHT ROCKS. These rocks are considered by geologists as an upper part of the chalk formation; and their place in the scale of strata is in immediate superposition above the chalk of England, and at some small interval below the calcaire grossier of the Paris basin.

MACE. The external envelope of the seed of the myristica moschata, affording an interesting example of an *arillus*, or expansion of the placenta.

MACERA'TION (*macero*, to make soft by steeping). The steeping of animal or vegetable substances in a cold liquid, for the purpose of softening the parts previously to distillation, or for that of dissolving their aromatic principles.

MA'CHINA PNEUMA'TICA. The Pneumatic Machine; a modern southern constellation, consisting of three stars.

MACHINE (*machina*, a frame or contrivance). Any instrument by which power, motion, or velocity, is applied or regulated. The force which puts a machine in motion is called the *first* or *prime mover.* The *point* at which that force is applied is the *acting point;* and that at which the effect is produced is the *working point;* the machine being the medium through which the power is transferred, and by which it is modified so as to answer the intended purpose. When a simple body is the medium between the *acting* and the *working points*, it is an *instrument.*

MACI'GNO. The Italian term for a hard siliceous sandstone, sometimes containing calcareous grains, mica, &c.

MA'CLE. *Chiastolite.* A mineral found imbedded in clay-slate, in the Pyrenees, and consisting principally of silica and alumina.

MACLU'REITE. *Chondrodite* or *brucite.* A mineral substance consisting of a silicate of magnesia with other matters, occurring in New Jersey and at Pargas in Finland, and named after Dr. Maclure.

MACQUER'S SALT. Neutral arsenical salt; super-arseniate of potass.

MACROCE'PHALOUS (μακρὸς, large, κεφαλὴ, the head). Large-headed; a term applied by Richard to those dicotyledonous embryos, in which the two cotyledons cohere, as in horse-chestnut.

Gærtner terms these embryos *pseudo-monocotyledonous.*

MA'CROCOSM (μακρὸς, large, κόσμος, the world). A term employed as synonymous with *universe;* while *microcosm* has been used by some philosophers as a designation of *man.*

MACRODA'CTYLES (μακρὸς, large, δάκτυλος, a finger or toe). A tribe of the Grallatores, or wading birds, characterized by the extreme length of their feet.

MACRO'PODAL (μακρὸς, large, ποῦς, ποδὸς, a foot). Large-footed; a term applied by Richard to a modification of the monocotyledonous embryo, in which the radicle presents an unusual protuberance, as in wheat.

MACROPO'DIANS (μακρὸς, large, ποῦς, ποδὸς, a foot). A tribe of brachyurous decapod crustaceans, remarkable for the enormous length of their feet, which has procured for them the name of *sea-spiders.*

MACROTRA'CHIA. A tribe of bivalved mollusca, in which the mantle of the animal is so united and prolonged as to form one or two long siphons or tubes, by which the food is imbibed.

MACROU'RA (μακρὸς, large, οὐρὰ, a tail). A family of decapod crustacea, distinguished by the large size of the tail, as in the common lobster.

MA'CULÆ (*macula,* a spot). Dark spots frequently seen on the disc of the sun. They change their appearance as the sun revolves on his axis, and appear greater or less to an observer on the earth, as they are turned to or from him. One of these was estimated to be more than six times the size of our earth.

MA'DREPORE. A genus of corals; but the term is generally applied to all the corals distinguished by superficial star-shaped cavities. In zoological language, the madrepores are compound polyps, the common body of which secretes calcareous matter on its exterior in arborescent masses, presenting upon their surface multitudes of cells, in each of which, when alive, a polyp existed.

MA'DREPORITE. *Anthraconite.* Columnar carbonate of lime, found in Norway in transition rocks, in Greenland, &c.

MAGDEBURG HEMISPHERES. An apparatus for exhibiting the force of the atmospheric pressure. Two hollow metallic hemispheres, whose edges fit accurately, are placed on each other, and the air is exhausted. Supposing the superficial content to be 100 square inches, and the height of the mercury to be 30 inches, the pressure exerted on the hemispheres will amount to 1475 lbs., and it will require the force of two horses to pull them asunder.

MAGELLA'NIC CLOUDS. The name of three nebulæ in the southern hemisphere, two of them about 12° or 13° from the south pole, the third more distant. They were first recorded by the navigator Magellan.

MAGIC LANTERN. The magic lantern is a microscope, on the same principle as the solar microscope. But instead of being used to magnify natural objects, it is commonly employed for amusement, by the casting of shadows of small transparent paintings, done on glass, upon a screen placed at a proper distance.

MAGIC SQUARE. A series of numbers in arithmetical progression, so arranged in a square order, that the vertical, horizontal, and diagonal columns give the same sum. Thus:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

or

1	16	11	6
13	4	7	10
8	9	14	3
12	5	2	15

MA'GISTERY (*magister,* a master). A *masterly* preparation, formerly applied, in Chemistry, to all precipitates, but now restricted to a few substances, as the *magistery,* or subnitrate, of *bismuth,* a brilliant white powder of pearly lustre, composed of microscopic crystalline grains; the *magistery of silver,* the alchemical name of the nitrate; &c.

MAGNE'SIA. An alkaline earth, having a metallic base, called *magnesium.* It has been found native, in the state of a hydrate. The term magnesia was originally applied to any substance which had the property of attracting some principle from the air.

MAGNESIAN LIMESTONE. An extensive series of beds, lying immediately above the Coal Measures, and so named from the presence of a large quantity of magnesia in the limestone. It contains fossils, and among them a few corals and shells.

MAGNE'SITE. Carbonate of magnesia; a white, hard, compact mineral, found in Moravia, in serpentine rocks.

MAGNE'SIUM. A metallic substance, resembling silver, fusing at a red heat, and then, on burning in air or oxygen, producing *magnesia*, or oxide of magnesium, which is white, inodorous, and forms an ingredient in many rocks, to which it usually communicates a soapy or greasy feel.

MAGNET. Magnets are substances which attract certain metals; which display towards one another a force partly attractive and partly repulsive; and, lastly, which exhibit a tendency to arrange their mass in a certain direction (see *Pole*). The term is probably derived from *Magnesia*, owing to the native iron ore, or *loadstone*, having been found in abundance near that city.

1. *Magnet, Natural and Artificial.* 1. The *natural* magnet, or loadstone, is a chemical combination of the oxide and the suboxide of iron. It occurs in the northern parts of the world, where it forms entire mountains. 2. *Artificial* magnets are commonly of steel, to which the magnetic properties are communicated by a particular process. They are of various forms: if cylinders or parallelopipeds, they are called *bar magnets;* if curved in the middle, so as to bring the two ends near together, they form *horse-shoe magnets;* when several bars or horseshoes are combined, the apparatus is called a *compound magnet*, or a *magnetic battery*, or, more simply, a *bundle* of magnets. Those artificial magnets which are constructed so as to move freely, and which will then invariably assume a certain definite position with respect to the earth, are called *needles*.

2. *Magnetic North.* A term applied to the direction of the magnetic needle, which, though commonly said to point to the north, usually points some degrees from it, one way or the other. For instance, all along the line which passes through the Cape de Verd Islands, the *magnetic north* is 15° west of the true meridian; and hence, a ship on this line, wanting to sail any particular course, steers 15° wrong by her compass to be right by the meridian.

3. *Magnetic Indifference, Point of.* That point of a magnet, somewhere about midway between the two extremities, where the attractive force, after continually diminishing as we proceed from either pole, ceases altogether.

4. *Magnetic Fluid.* The hypothetical agent, to which the phenomena of magnetism have been referred. Some have supposed two such fluids,—a *boreal* or northern, and an *austral* or southern. The former of these is also distinguished as *positive*, the latter as *negative* magnetism, neither of which, however, is found singly combined with the particles of matter, but always both together.

5. *Magnetic Curves.* The curved lines into which iron-filings arrange themselves when dropped gently on a plate of glass having a magnet beneath it. The filings will be found to accumulate most perceptibly about the poles of the magnet, and to arrange themselves in curved lines extending from one pole to the other.

6. *Magnetic Induction.* That property by which each pole of a magnet excites magnetism in any magnetizable body within a certain distance of itself, imparting an opposite polarity to its own to the contiguous end of such a body, and similar polarity to its remote end. The range within which the magnet exerts an influence is termed its *circle of magnetic influence*, or its *magnetic atmosphere*.

7. *Magnetic Points of Convergence.* The name given to two points, near to the north and south poles of our planet, around which are drawn the *isogonic lines*, or lines of equal declination. The two points are also called the magnetic poles of the earth.

8. *Magnetic Equator.* The name of an irregular curve in the neighbourhood of the terrestrial equator, where a needle balances itself perfectly horizontally. It is also called the *aclinic line*.

9. *Magneto-electrical Rotatory Machine.* An apparatus for rendering the magneto-electric induction currents continuous, and for converting their alternating direction into a constant one. Such a machine may be employed as a substitute in part for a common electrical machine, and in part also for a voltaic pile, as it is capable of producing electric sparks, incandescence and fusion of wire, intense light at charcoal points, physiological effects, chemical decomposition, and magnetic action of many kinds.

MAGNET, ARSENICAL. A corrosive preparation of equal parts of sulphur, white arsenic, and common antimony, mixed by fusion.

MAGNE'TIC PYRI'TES. Native black sulphuret of iron. It attracts the magnetic needle.

MA'GNETISM. A term expressing the peculiar property occasionally possessed by certain bodies, more especially by iron and some of its compounds, by which, under certain circumstances, they mutually attract or repel one another, according to determinate laws. See *Magnet.*

MAGNETO-ELECTRICITY. A term applied to those electric phenomena which may be produced by magnetism.

MAGNETO'METER. The term applied by Gauss to a magnetic apparatus consisting of bars of iron from one to four feet in length, and weighing from 1 lb. to 25 lbs. These masses are not affected, like the needle, by variations of temperature, nor by the presence of other similar bodies, while at the same time they are capable of indicating the minutest variations in the intensity of the earth's magnetism, by changes in the position of the magnetometer, which can be measured to an angle of one second.

MAGNE'TOMO'TOR. A voltaic series of two or more large plates, for producing a great quantity of electricity of low tension, and thus exhibiting the phenomena of electro-magnetism.

MAGNIFYING GLASS. A convex lens, which increases the apparent size of objects viewed at a small distance through it. It is also termed a *burning glass*, because, when the sun's rays are brought to a point, after passing through a lens of this kind, they produce a strong heat.

MA'GNITUDE (*magnitudo*, size). The general term for quantity of space. In Geometry, it denotes the space occupied by any figure, and has relation to the three dimensions of length, breadth, and thickness. It may, in fact, be applied to any thing which involves the question of "greater or less."

1. When one magnitude is compared with another of the same kind, the first is called the *antecedent*, and the second the *consequent*.

2. One magnitude is said to be a *multiple* of another, when it contains that other a certain number of times exactly: and the other magnitude, which is contained in the first a certain number of times exactly, is said to be a *submultiple*, or *measure*, or *part* of the first. Hence, also, one magnitude is said to *measure* another, when it is contained in the other a certain number of times exactly.

3. Two magnitudes are said to be *equimultiples* of two others, when they contain those others the same number of times exactly: and the other magnitudes, which are contained in the first the same number of times exactly, are said to be *like parts* of the first two. Thus, 7 A, 7 B, are equimultiples of A, B; and A, B, are like parts of 7 A, 7 B.

4. Two magnitudes are said to be *commensurable* with one another, when *a common measure* of the two may be found, that is, a magnitude which is contained in each of them a certain number of times exactly. In like manner, any number of magnitudes are said to be *commensurable*, when there is some magnitude which is contained in each of them a certain number of times exactly. Magnitudes which have no common measure are said to be *incommensurable*.

MA'GNITUDE, APPARENT. The name given to the *angle* under which an object *appears* at the eye, or the angle formed by lines drawn from the extremities of the object to the eye. The idea which we form of the *real magnitude* is not that which is necessarily conveyed with the first gift of sight, but is gradually made out by the help of experience. The sun and moon are nearly of the same apparent size.

MA'GNITUDE OF STARS. The magnitudes of stars are vaguely derived from their apparent brilliancies. Very brilliant stars, though of varying brilliancy, are said to be of the *first* magnitude; stars of the next degree of brilliancy are said to be of the *second* magnitude; and so on. Yet there is little perceptible difference between the boundary stars of any two adjoining classes, and hence there is no little confusion.

MA'IIDÆ or MA'INS. A tribe of brachyurous crustaceans, or Crabs, named from the genus *maia*, or sea-spider, as it is commonly called.

MAJOR and MINOR. These terms are applied, in Music, to imperfect concords, which differ from each other by a semitone.

MAJOR TERM. In Logic, the Major Term of a syllogism is the predicate of the conclusion. The Major Premiss is the one which contains the major term. In hypothetical syllogisms, the hypothetical premiss is called the major.

MA'LACHITE. *Green bice.* A carbonate of copper; a green carbonate, occurring with a *fibrous* structure and velvety appearance, and with a *compact* structure in the mines of the Uralian mountains.

MA'LACOLITE. *Sahlite.* A pyroxenic mineral, consisting of a silicate of magnesia and lime, found in Shetland, &c. It is a sub-species of oblique-edged augite.

MALACO'LOGY (μαλακὸς, soft, λόγος, a description). The science of the Mollusca, termed by Aristotle *malakia*, comprehending the examination both of the animal and of the shell. It differs from *Conchology*, which is limited to the arrangement of the shells, and, in this respect, cannot claim a place amongst the sciences.

MALACO'PTERY'GII (μαλακὸς, soft, πτερύγιον, a fin). An order of Osseous Fishes, in which the fins are all soft or jointed. The order is subdivided, according to the position or absence of the ventral fin, into—

1. *M. abdominales*, in which the ventral fins are attached to the abdomen behind the pectorals. These include the greater part of the fresh-water fishes.

2. *M. sub-brachiati*, in which the ventral fins are brought forward under the pectorals, and the fishes, which are chiefly marine, enjoy a considerable power of ascending and descending in the water.

3. *M. apoda*, in which the ventral fins are always wanting, and not unfrequently the pectoral also.

MALACO'STRACA (μαλακὸς, soft, ὄστρακον, a shell). A sub-class of the *Crustacea*, in which the animals have seven thoracic and seven abdominal segments. The term was given by Aristotle to the modern Crustacea, because their shells were softer than those of the Mollusca, or ordinary shell-fish. The Malacostraca are divided into two groups, according to the attachment of the eyes: those with immoveable sessile eyes form the *Edriophthalma;* those with moveable pedunculated eyes, the *Podophthalma.*

MALACTI'NIA (μαλακὸς, soft). The third class of the Radiata, consisting of soft aquatic animals, emitting an acid secretion from their surface, which is capable of irritating and inflaming the human skin, like the stinging of a nettle; hence the name *acalephæ*, or nettles, has been commonly given to this class. They are divided, according to their modes of locomotion, into the following orders:—

1. *Ciliograda*, or those which move by vibratile cilia, as beroe.

2. *Physograda*, which float by means of air-sacks, as physalia.

3. *Palliograda*, which move by the muscular contractions of a superior discoid mantle, as rhizostoma Cuvieri.—*Grant.*

MALAY RACE. One of the five principal divisions of mankind, in which the summit of the head is slightly narrowed, the forehead a little arched, the upper jaw somewhat projecting, the face less narrow, and the features more prominent and better marked than in the negro. This race includes the inhabitants of the South Sea Islands.

MALIC ACID (μᾶλον, an apple). An acid existing in apples, but generally prepared from the berries of the *sorbus aucuparia*, or mountain ash. It forms salts with alkaline and magnesian bases, called *malates.*

MALLEABI'LITY (*malleus*, a hammer). A property of some metals, by which they are capable of being beaten out into plates, or leaves, by the hammer, as in the case of gold-leaf. This property depends upon a high degree of *tenacity*, connected with a certain degree of *softness.*

MA'LLEIDÆ. A family of monomyarian conchifers, in the system of Lamarck, named from the genus *malleus*, and belonging to the *ostracea* of Cuvier, the *oxygones* of Latreille.

MA'LLEOLUS. This term is Latin for a *hammer*, and is applied, in the botanical process of layering, to the *layer* which is separated from the parent plant, from its lower end resembling a hammer-head, of which the new plant represents the handle.

MALTHA. *Sea-wax.* A solid, whitish, bituminous substance, not unlike tallow, found in Siberia and Persia. It is, probably, the *bitumen candidum* of Pliny.

MALTING. The process of making malt; it consists in the inducing of an artificial growth or germination of barley, by steeping in water, and then evolving the saccharine principle by the application of heat.

MALVACEÆ. The Mallow tribe of dicotyledonous plants. Herbaceous plants, trees, or shrubs, with *leaves* alternate; *flowers* polypetalous; *stamens* hypogynous, monadelphous; *fruit* capsular or baccate, containing seed with crumpled cotyledons.

MAMMA'LIA (*mamma*, a teat). The fifth class of Vertebrate animals, which are provided with mammary glands for the lactation of their young. To this it may be added, that the visceral cavity is separated into a thorax and an abdomen by a muscular diaphragm, and that all the animals of the class breathe by means of lungs precisely similar to our own. See *Zoology.*

MAMMA'LOGY. An unclassical term, denoting the science of mammals, or animals furnished with mammæ, including man, the quadrupeds, the quadrumanous animals, and the whales. The terms *mastology* and *mastozoology* have been suggested, as being entirely of Greek derivation. See *Mammalia.*

MA'MMIFERS (*mamma*, a breast, *fero*, to bear). *Mammal.* A term applied to animals which give suck to their young, including all the warm-blooded quadrupeds and the cetaceous animals.

MA'MMILLARY (*mammilla*, a little breast). A term applied to a surface which is studded over with prominences which are smooth, thick, and rounded, like a teat.

MA'MMOTH. A word of Tartar origin, denoting an extinct species of the elephant (*Elephas primigenius*), of which the fossil bones occur in various countries. The term is applied in Siberia to animals which burrow under ground.

MAN. Under the several articles, *American, Caucasian, Ethiopian, Malay,* and *Mongolian Race*, the characters of these varieties of man are briefly recorded. Dr. Prichard refers the differences of complexion in man to three principal varieties, viz.:—

1. The *Melanocomous*, or black-haired, which is the complexion generally prevalent, except in the northern parts of Europe and Asia. The colour of the skin varies in intensity from the black of the African negro to the light olive of the northern Hindoo, thence to every degree of shade in the Persian and other Asiatics, to that of the swarthy Spaniard and of black-haired Europeans in general.

2. The *Leucous*, albino, or white-haired, occurring in all countries, perhaps most frequently in hot climates. They are characterized by the entire absence of colouring matter from the skin, hair, and eyes; the skin is consequently milk-white or of a pinkish hue, the hair silky-white or at most yellowish, the iris rosy, and the pupil intensely red.

3. The *Xanthous*, or yellow-haired, including the light-brown, auburn, yellow, and red varieties. The complexion is fair, becoming more or less red on exposure to heat and light. The eyes are light-coloured. This variety predominates in the temperately cold regions of Europe and Asia.

MA'NAKINS. A group of small birds, remarkable for their rich plumage. Mr. Swainson makes them a sub-family of the Ampelidæ, under the name of *Piprinæ.*

MA'NATIDÆ (*manatus*, the sea-cow, or lamantine). A small family of aquatic herbivorous animals, placed by Cuvier among the *Cetacea.* By others they are considered to differ from the whales, and to resemble the hippopotamus, sufficiently to be placed among the Pachydermatous animals.

MANDIBULA'TA (*mandibulum*, a mandible or jaw). Mandibulate Insects; a group in which the mouth is furnished with *mandibles* or jaws, adapted for biting and bruising. This division includes the coleopterous, orthopterous, neuropterous, and hymenopterous insects. See *Haustellata.*

MA'NGANESE. A metal similar to iron, brittle, and with difficulty fused, occurring in the state of oxide in some rocks, to which it generally gives a purplish-red colour. The binoxide, used in chemistry, is commonly termed *native black*, or *peroxide* of manganese.

MANGANESE BLENDE. *Kobellite.* An ore of manganese, in which sulphur occurs in combination with the metal, found at Nagyag in Transylvania and in Mexico.

MA'NGANIC ACID. An acid consisting of one atom of manganese and three of oxygen. It has not hitherto been obtained in a separate state, but exists in the manganate of potash, commonly called *mineral chameleon.*

MA'NGANITE. An ore of manganese, consisting of two prime proportions of the deutoxide of the metal, combined with one of water.

MANHEIM GOLD. A species of brass, consisting of three parts of copper and one part of zinc.

MANIPULA'TION (*manipulus*, a handful). In chemistry and experimental philosophy, this term denotes the application of skill in conducting the various operations of the laboratory.

MANO'METER (*μανὸς*, rare, *μέτρον*, a measure). *Manoscope.* A steam-barometer, employed chiefly for measuring the force of the steam in boilers. The term is also applied to an instrument for testing the rarity of the air. See *Dasymeter.*

MA'NTIDÆ. A family of orthopterous insects, named from the genus *mantis*, and remarkable for their grotesque forms, closely resembling that of a plant. The *mantis religiosa*, or praying insect, has received its name from the peculiar position of the anterior pair of legs, like the hands of a person at prayer.

MANTLE. The external soft contractile skin of the Mollusca, which covers the viscera and a great part of the body, like a cloak.

MANU'RES. Animal, vegetable, or mineral matters, deposited in the soil, to accelerate vegetation and increase the production of crops.

MAP (*mappa*, a napkin). A representation, upon a plane, of some portion of the surface of a sphere, on which are traced the particulars intended to be expressed, whether they be continuous outlines or points. The projections chiefly used in maps are the orthographic, the stereographic, and Mercator's. See *Projection.*

MARBLE. A term applied to every limestone which is finely coloured and capable of receiving a high polish, or of being worked into statuary; the pure white crystalline kinds being those employed for the latter purpose. *Forest marble* is a coarse laminated shelly oolite, interposed between beds of clay, sand, and grit.

MARCEL'S BLOWPIPE. An apparatus for increasing temperature, by urging the flame of an alcohol lamp by a blowpipe supplied with oxygen gas.

MA'RGARIC ACID (μαργαρὶς, a pearl). An acid obtained from human fat and vegetable fixed oils, and also produced by the dry distillation of ox and mutton suet, and of stearic acid. Its name is derived from its *pearly* lustre.

MA'RGARIN. Margarate of glyceryl; a peculiar fatty matter contained in vegetable oils and animal fats.

MA'RGARITE. A greyish-white mineral, resembling silvery mica.

MARGARI'TIC ACID. One of the fatty acids produced by the saponification of castor oil. The other acids obtained by this process are the *ricinic* and the *elœodic.*

MA'RGARONE. A solid white fatty matter, crystallizing in pearly scales, obtained by dry distillation of margaric acid.

MARGINELLI'NÆ. Date-shells; an aberrant sub-family of the *Volutidæ*, or volutes, named from the typical genus *marginella*, having plaits upon the pillar, and crenated teeth on the thickened outer lip; the foot very large, but the mantle not lobed nor reflected.

MARINE ACID. *Spirit of salt.* Muriatic or hydrochloric acid, procured from common salt by distilling it with sulphuric acid and water over a water-bath.

MARINE CONGLOMERATES. Deposits formed by sand thrown by the sea upon its shores, mixed with remains of shells and corals, which are agglutinated by a calcareous cement, finally acquiring a tolerably firm consistence. Rocks of this kind are daily forming on the shores of Sicily, and are very abundant in the West Indies.

MARINER'S COMPASS. An instrument consisting of a small magnetic bar, called a needle, poised on its centre of gravity, so as to be enabled to turn readily every way in a horizontal direction. After a few vibrating motions, during which it is said to *traverse*, the needle takes its direction nearly north and south, which direction is said to be in the plane of the *magnetic meridian* of the place where the compass happens to be.

Compass variation. A term expressive of the angle, which the *magnetic meridian* is east or west from the *geographical*, or true north and south. It varies in different places and at different times.

MARIOTTE'S LAW. Boyle and Mariotte experimentally investigated the ratio subsisting between the density of the air, its elasticity, and the space it occupies, when the following law was detected:—that *the density and elasticity of atmospheric air are directly, but the space it occupies is inversely, as the force of compression.*

MA'RKAB. A star of the second magnitude in the northern constellation Pegasus.

MARL. An argillaceous rock, consisting of clay mixed with lime; soft, friable, but not forming a tenacious paste with water; it is grey, yellow, green, blue, or red. The *variegated marls*, or keuper, are red, greenish-grey, and bluish, and contain subordinate beds of sandstone and dolomite, deposits of brown coal, masses of gypsum, and salt. These marls are covered with a white quartz sandstone, which connects them with the lias.

MARLSTONE. A constituent of the lias formation, consisting of arenaceous and calcareous layers, with nodules of ironstone. This rock is well developed in Yorkshire and Leicestershire.

MA'RMOLITE. A variety of serpentine, found at Hoboken, in New Jersey.

MARS. The planet which immediately follows our earth in respect of distance from the sun, from which he is separated by 146 millions of miles. His diameter appears to be sometimes 18″, sometimes 19″. He revolves on his axis in 24^{h}, 31′ 22″, and completes his orbit round the sun in 686^{d}, 23^{h}, 30′ 41″, 4.

MARSH'S APPARATUS. An apparatus for detecting the presence of arsenious acid in solution.

MARSUPIA'TA (*marsupium*, a pouch). Marsupial animals; an order of Mammalia, having a sack or pouch under the belly in which they carry their young, as the kangaroo and opossum. They are *ovo-viviparous* animals, being intermediate between the truly viviparous mammalia, and the oviparous birds and reptiles.

MA'RTIAL. An old mythological designation of several preparations of iron, from *Mars*, the god of war. Hence we have *martial ethiops*, or the protoxide; *martial pyrites*, or the sulphuret.

MASS (μάσσομαι, to knead together). In physics, a term synonymous with *quantity:* thus, the mass of a body is the quantity of matter it contains. The *mass* and *density* of bodies are estimated according to their various degrees of porosity. The *mass* represents the number of material particles in a body: the greater the mass, the less porous is the substance. *Density*, on the contrary, expresses the relation of the masses when the volumes are equal: *i. e.* "*of two bodies that is the more dense, which with equal bulk contains the greater mass.*"

MASSES, GLOBULAR. *Nodules.* These terms are applied, in Geology, to rocks of irregular form, varying from a foot to a mile or more, and imbedded either in a stratified or a massive rock. *Irregular masses* are rocks of no determinate form, and of any size, as granite, greenstone, porphyry.

MA'SSICOT. Yellow oxide, or protoxide of lead. When partially fused by heat, it is called *litharge.*

MA'STODON (μαστὸς, a breast, ὀδοὺς, a tooth). A genus of fossil extinct quadrupeds, allied to the elephant, and so called from the form of the hind teeth, or grinders, which have their surface covered with conical mammillary crests.

MATER ACETI. Mother of Vinegar; a mould-plant, belonging to the genus *mycoderma*, which is developed in vinegar, and forms thereon a thick leather-like coat, similar to the inflammatory crust which covers the crassamentum of blood drawn from rheumatic patients.

MATE'RIALISM. A philosophical system which refers all existence, including the nature of the mind or soul itself, to a modification of matter. By this system the brain is supposed to secrete thought, as the liver secretes bile.

MATHEMA'TICS (μάθησις, learning). The science which teaches the properties of numbers and of figures. It is, accordingly, divided into two branches, viz. *arithmetic*, the science of number, and *geometry*, the science of figure.

Mixed Mathematics denotes mathematical reasoning upon facts in nature, and is so named in contradistinction to *pure* or *abstract mathematics*, which is employed in reasoning on figures and numbers, without reference to facts in nature.

MATRASS. A cucurbit, or vessel of glass, porcelain, or metal, usually of a globular shape, and open at the top, for the chemical purposes of digestion, evaporation, &c. See *Alembic.*

MATRIX. *Gangue.* The earthy or stony matter which accompanies ores, or envelopes them in the earth.

MATTER. The general designation of whatever occupies space, and possesses extension and impenetrability: all bodies are matter with fixed boundaries. The *physical* and *chemical* properties of matter have given rise to two branches of science, viz. *physics* and *chemistry.*

MAXILLO'SA (*maxilla*, a jaw). A group of Crustaceous animals, in which the mouth is furnished with jaws, as distinguished from the *Edentata*, in which the mouth is prolonged in the shape of a sucker. These two groups are precisely analogous to those of the mandibulata and the haustellata among insects.

MA'XIMA and MI'NIMA. These terms, simply signifying "the greatest" and "the least," are employed, in analysis, to signify not the absolute greatest and least values of a variable quantity, but the values it has when it ceases to increase, and begins to decrease, and *vice versâ.* A variable quantity may, therefore, have many maxima and minima, as the highest and lowest points at which the mercury stands in a barometer at different times.

MEAN QUANTITY. In Mathematics, the mean of two or more quantities is a quantity of intermediate value, found by determinate rules. There are several modes of finding a mean quantity. Thus:—

1. The *arithmetical mean* of several quantities is simply the *average* found by dividing the sum of all the quantities by their number; and this is the mean always understood, unless another kind be specified. Thus, if three measures of the same length give 122, 123, and 123·4, the average or arithmetical mean is 122·8.

2. The *geometrical mean* of two quantities is the square root of the product of those quantities. In Geometry, the term is synonymous with *mean proportional*, and it is a quantity, such that, if placed between two given quantities, a series of three continued proportionals would be formed; in other words, the first of the two given quantities is to the mean proportional as this is to the other given quantity.

3. The *harmonical mean* is a number, such that, the first and third terms being given, the first is to the third as the difference of the first and second is to the difference of the second and third, the second being the harmonical mean.

MEAN SUN. Solar days are not equal in duration; a clock regulated by the sun would, consequently, need frequent adjustment. To avoid this, an imaginary or *mean* sun is supposed to move *regularly round the equator* in the same time as that in which the true sun moves *irregularly round the ecliptic*. Such a time represents a mean solar day, and it is the average of all the apparent solar days in a year. See *Equation of Time*.

1. *Mean Noon.* This is an expression connected with the above fiction of a *mean sun;* and the term "mean" is here, as above, opposed to "apparent" or "real." Thus, *apparent noon* is the real or true noon, when the true sun, the sun which *appears*, is on the meridian; whereas *mean noon* takes place when the mean sun, the average imaginary sun, which does *not appear* at all, is on the meridian.

2. *Mean Moon.* The still greater absence of uniformity in the actual motion of the moon induced astronomers to employ an imaginary or *mean* moon, in the same manner as the "mean sun" above mentioned. This mean moon is made to move uniformly in the equator, or in the ecliptic, as required. The *Kalendar Moon* is another fictitious moon, employed for regulating the finding of Easter; this moon is generally a day or more distant from the mean moon.

3. *Mean Time.* Equal or *mean* time is that which is reckoned by a clock, supposed to indicate exactly twenty-four hours, from twelve o'clock on one day to twelve o'clock on the next day. *Apparent* or real time is that which is measured by the apparent motion of the sun in the heavens, as indicated by a meridian line, or sun-dial.

4. *Mean Anomaly of a Planet.* Its angular distance from the aphelion or perihelion, supposing the planet to revolve in a circle with its mean velocity.

5. *Mean Conjunction or Opposition.* The mean place of the sun when in conjunction with, or opposition to, the mean place of the moon in the ecliptic.

6. *Mean Distance of a Planet from the Sun.* An arithmetical mean between the planet's greatest and least distances; or, the semi-transverse diameter of its orbit.

MEANS and EXTREMES. In any proportion the first and fourth terms are called the *extremes*, the second and third the *means*, and the product of the former is equal to the product of the latter. Thus, in the proportion 15 : 20 :: 21 : 28, since the two ratios are equal, we have

$$\frac{15}{20} = \frac{21}{28};$$

and, if we multiply each of these equals by 20×28, we have $15 \times 28 = 20 \times 21$, or the 1st × 4th = 2nd × 3rd. See *Proportion*.

MEASURE OF A NUMBER. One number is said to be a *measure* or a *factor* of another, when it divides it exactly, without a remainder. Thus, 1, 2, 3, 4, 6, 12, are all measures or factors of 12. *Unity*, however, is not generally named among the divisors of a number.

1. *Greatest Common Measure.* Any number which divides without remainder each of two or more numbers, is said to be a *common* measure or *common* factor of those numbers; and, of course, the greatest number which so divides them is their *greatest common measure.* Thus, 3, 5, 15, are each of them common measures of 30 and of 45, and 15 is their greatest common measure.

2. *Measure, in Geometry.* A magnitude or quantity assumed as a unit, and employed to express the relations of other magnitudes or quantities of the same kind. Euclid defines the measure of a quantity to be that which, being repeated a certain number of times, becomes equal to the quantity measured.

MEASURES (in Geology). A term sometimes employed as synonymous with beds or strata.

MECHANICAL CURVE. This is now called the *transcendental curve.* It is a curve in which the relation between the abscissa and the ordinate cannot be expressed by an algebraic equation.

MECHANICAL ORIGIN, ROCKS OF. A term applied to rocks composed of sand, pebbles, or fragments, to distinguish them from those of a uniform crystalline texture, which are of chemical origin.

MECHANICAL PHILOSOPHY. The application of mechanics to physical science. Hence the term *Mechanists* was applied to those philosophers who referred all the phenomena of the universe to the agency of mechanical forces, in opposition to the *Dynamical school*, which insists on a living principle in nature, antecedent to, and distinct from, the visible phenomena of nature.

MECHANICAL POWERS. The general designation of six *simple* machines, viz., the lever, the pulley, the wheel and axle, the inclined plane, the wedge, and the screw. All the different *compound* engines, however mixed or complex their construction, consist only of various combinations of these few individual powers.

MECHANICAL SOLUTION. A term applied to the solution of those geometrical problems which require other instruments (*machinæ*) than those employed in the constructions of pure geometry. The latter being effected merely by straight lines and circles, require only a rule and compasses.

MECHA'NICS (*μηχάνη*, a machine). The science which treats of the equilibrium and motion of bodies. That part of the subject which relates to the conditions of equilibrium is called *statics;* while that which investigates the motion which a body acquires when the forces applied to it are not in equilibrium, is termed *dynamics*.

MECHLO'IC ACID. A compound of meconia, a neutral principle existing in opium, and chlorine, discovered in 1835 by Couerbe.

MECO'NIC ACID (*μήκων*, a poppy). A tribasic acid, obtained from poppies, constituting the characteristic acid of opium. Its congeners are the *comenic*, which is bibasic; and the *parameconic*, which is monobasic.

MEDIUM (*medius*, middle). In Physics, the space or substance in which bodies subsist or move. Newton conceived a universal medium, or *ether*, more subtil than air, through which the heavenly bodies move. This idea favours the theory of the transmission of light by undulation.

MEDU'LLARY RAYS (*medulla*, pith). A botanical term applied to the thin vertical radiating plates of muriform cellular tissue, which serve to connect the centre of an exogenous stem with the circumference. They are technically called the *silver grain*, and they produce, on a longitudinal section of the stem, the glancy lustre which so remarkably characterizes the plane and the sycamore.

MEDU'LLARY SHEATH (*medulla*, pith). The sheath which immediately surrounds the medulla, or pith, of exogenous plants. It consists of spiral vessels and woody tissue, and forms an exceedingly thin layer.

MEDU'LLIN (*medulla*, marrow). The name given by Dr. John to the porous pith of the sun-flower.

MEDU'SA. A genus of the Acalephæ, or Sea-nettles; marine radiated animals, without shells. The name is derived from their organs of motion being spread out like the snaky hair of the fabulous Medusa. On being touched, they induce redness and a tingling sensation; they are also supposed to occasion, in certain latitudes, the phosphorescent appearance of the sea.

MEE'RSCHAUM. *Ecume de mer*. A silicate of magnesia; a greasy, soapy substance, occurring in Cornwall. In Germany and Turkey it is manufactured into tobacco-pipes.

MEGALO'PTERANS (*μέγας*, great, *πτερὸν*, a wing). A family of Neuropterous insects, characterized by their large wings horizontally folded.—*Latreille*.

MEGALOSAU'RUS (*μεγάλη σαύρα*, great lizard). A fossil gigantic amphibious animal of the saurian, or lizard and crocodile tribe, found in the oolitic slate at Stonesfield, near Woodstock, and other localities.

MEGANY'CTERANS (*μέγας*, large, *νύκτερις*, a bat). A tribe of Cheiropterous animals, including the largest species of bats, or "flying foxes."

MEGAPODI'IDÆ. The name given by Mr. Swainson to a family of the Rasores, from the genus *megapodius*, which, with the allied genera, is referred by other naturalists to the Cracidæ, or Curassows.

ME'GASCOPE (*μέγας*, large, *σκοπέω*, to examine). An optical instrument, constructed on the principle of the solar microscope, for examining bodies of large dimensions.

MEGATHE'RIUM (*μέγα θηρίον*, great beast). A fossil extinct quadruped, resembling a gigantic sloth, and characteristic of the later tertiary period on the continent of South America. This, and some other genera of extinct Edentata, constitute the *Megatheriidæ*, or megatheroids of Owen.

MEI'ONITE. Prismato-pyramidal felspar, occurring together with ceylanite and nepheline, in granular limestone, at Monte Somma, near Naples. This, and some other felspathic substances are now united under the general term *wernerite*.

MELAIN (μέλας, black). The colouring matter of the ink of the cuttle-fish.

MELAM. A substance formed by distilling dry hydro-sulpho-cyanate of ammonia. On boiling melam with hydro-chloric acid, a crystalline substance is generated, called *melamine*.

MELANIA'NÆ. Black snails; a subfamily of the *Turbidæ*, named from the genus *melania*, and having a spiral shell, the spire being generally longer than the aperture, the body-whorl small.

ME'LANIC (μέλας, black). A term applied by Dr. Prichard to one of the three varieties of mankind, derived from the colour of the hair, and including all individuals or races which have *black* hair. See *Man*.

ME'LANITE. A black variety of garnet, found in the neighbourhood of Frascati, near Rome, and in the basalt of Bohemia.

MELA'NTERITE. A mineralogical name for green vitriol, or native sulphate of iron.

MELANTHA'CEÆ. The Colchicum tribe of monocotyledonous plants. Herbs with a *rhizome*, sometimes fleshy; *leaves* sheathing at the base; *flowers* hexapetaloïdeous, tubular; *stamens* 6; *ovarium* 3-celled; *seeds* albuminous.

MELASO'MA (μέλας, black, σῶμα, the body). A family of the heteromerous *Coleoptera*, characterized by the black or ashy-brown colour of the body. The wings are usually absent, and the elytra, or wing cases, united.

MELA'SSES (μέλι, honey). The uncrystallizable part of the juice of the sugar-cane, separated from the sugar during its manufacture.

MELA'SSIC ACID (μέλι, honey). An acid produced by the simultaneous action of alkalies and heat upon grape sugar.

MELASTOMA'CEÆ (μέλας, black, στόμα, mouth; from the fruit of some of the species staining the lips black). A family of dicotyledonous plants, characterized by their opposite leaves, with several large veins running from the base to the apex, resembling those of monocotyledonous plants; and the long-beaked anthers.

MELIA'CEÆ. The Bead-tree tribe of dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* symmetrical; *calyx* imbricated; *stamens* hypogynous; *ovarium* of several cells; *seeds* definite, apterous.

ME'LILITE. A species of garnet, found at Capo di Bove, near Rome.

MELIPHA'GIDÆ (μέλι, honey, φάγω, to eat). The Honey-suckers; a family of the *Insessores* or Perching birds, distinguished from all the allied families by their notched bill. They are chiefly confined to Australia. (See *Tenuirostres*.) According to Macgillivray, these birds constitute a family of the *Reptatrices*, or Creepers, characterized by having the three fore toes more or less united at the base, and spreading little.

ME'LLITATES. Salts formed by the combination of mellitic acid with a salifiable base.

ME'LLITE. *Honey-stone*. Mellitate of alumina; a salt found in beds of brown coal at Artern in Thuringia.

ME'LLITIC ACID (μέλι, honey). An acid discovered in *mellite*, or honey-stone, a rare mineral, consisting of the mellitate of ammonia.

ME'LLON. A lemon-yellow substance consisting of azote and carbon, considered as a compound radical.

ME'LODY (μελῳδία, a singing). The combination of harmonious sounds is a *chord;* an agreeable succession of notes is a *melody;* and a succession of chords constitutes *harmony*.

MELOLO'NTHIDÆ. A family of Coleopterous insects, of the section lamellicornes, named from the *melolontha vulgaris*, or common cockchafer.

MELONI'DIUM (μῆλον, an apple). The name given by Richard to an inferior compound fruit with a fleshy pericarp—the *pomum* of other writers.

MELTING POINT. That point of the thermometer which indicates the temperature at which a solid becomes fluid. Thus, ice melts at 32° Fahr., sulphur at 218°, gold at 5237°.

ME'NACHANITE. An oxide of titanium, found. accompanied with fine quartz sand, in the bed of a rivulet which enters the valley of Menaccan in Cornwall.

ME'NILITE. A sub-species of indivisible quartz; an opaline substance, called also *liver opal*, from its brown colour, found at Menil-Montant, near Paris, in a bed of adhesive slate. Another kind, called *grey menilite*, occurs at

Argenteuil, near Paris, imbedded in a clayey marl.

MENI'SCUS (μήνη, the moon). A lens which is concave on one side and convex on the other, its section resembling the appearance of the new moon.

MENISPERMA'CEÆ (μήνη, the moon, σπέρμα, seed; so named from the crescent-like form of the fruit of the typical genus *menispermum*). The Cocculus tribe of Dicotyledonous plants. *Leaves* alternate; *flowers* polypetalous, unisexual; *stamens* hypogynous; *fruit* a 1-seeded drupe.

MENISPE'RMIC ACID. An acid obtained from the berries of the *menispermum cocculus*, where it exists in combination with the alkaloid *picrotoxia*.

MENKAR, or α CETUS. A star of the second magnitude in the head of the southern constellation Cetus.

ME'NSTRUAL EQUATION. The name given to an apparent *monthly* displacement of the sun in longitude, of a parallactic kind, owing to the *real* nature of the curve described by the earth's centre, which is not an exact ellipse, but an undulated curve. The actual deviation or excursion of the earth from the ellipse is, however, very small, the greatest amount of the menstrual equation being less than the sun's horizontal parallax, or than $8{\cdot}6''$.

ME'NSTRUUM. A chemical term synonymous with *solvent*, and denoting a liquid which does not change the nature of the substance to be dissolved. Thus, pure *water* is employed to dissolve gum, *alcohol* to dissolve resins, *acids* to dissolve the bases of colchicum and squill.

MENSURA'TION. The operation of measuring; a term generally denoting the application of arithmetic to geometry, and the methods of finding the dimensions and areas of figures, the contents of solids, &c.

MEPHI'TIC ACID. A designation of carbonic acid gas, derived from *Mephitis*, the fabled Roman goddess of impure exhalations. *Mephitic air* is another name for nitrogen gas.

MERCA'PTAN. A compound of hydrogen, carbon, and sulphur, named from its energetic action on binoxide of mercury—quasi *mercurium captans*. It is alcohol, of which the oxygen is replaced by sulphur.

MERCA'TOR'S CHART. An artificial mode of representing a sphere upon a plane, adopted for nautical charts. See *Projection*.

ME'RCURY. The nearest planet to the sun, from which it appears to be separated only from sixteen to twenty-nine degrees. Its direct distance from the earth is 37,143,000 miles; its apparent diameter is about seven minutes, nearly two-fifths that of the earth. It turns on its axis in 24^{h}, $5'\ 3''$, and completes its orbit in 87^{d}, 23^{h}, $25'\ 44''$, with a velocity of 111,000 miles an hour. It sometimes crosses the disc of the sun, so as to appear like a small dark spot passing over the sun's face; this is called the *transit* of Mercury.

ME'RCURY (in Chemistry). A metal which is always fluid at a temperature above —39°. From its mobility and its resemblance to silver, it is commonly called *quicksilver*.

1. *Native* or *Virgin Mercury*. The pure metal, found in the form of globules, in cavities of the ores of this metal.

2. *Native Amalgam*. An ore consisting of mercury combined with silver.

3. *Native Cinnabar*. Native vermilion, or the bisulphuret of mercury; the ore which yields the mercury of commerce.

4. *Corneous Mercury*. Mercurial horn ore, or the proto-chloride of mercury.

MERE'NCHYMA (μέρος, a part, ἔγχυμα, an infusion). *Sphærenchyma*. A term applied by Morren to the spherical variety of the parenchyma of plants.

MERGANI'NÆ. *Merginæ*. A subfamily of the Anatidæ, consisting of the genus *mergus*, the goosander or merganser of the British.

ME'RICARP (μέρος, a part, καρπὸς, fruit). The botanical designation of a half of the fruit of Umbelliferous plants. What are called *seeds* in these plants are, in fact, *fruits*, each consisting of two achenia, or *mericarps*, placed face to face, and separating from a central axis. The two together are called *cremocarp* (κρεμάω, to suspend), from their being suspended from the common central axis.

MERI'DIAN (*meridies*, noon or midday). A geographical term, denoting a great circle of the sphere passing through the zenith and the poles of the earth. The *line* which marks the longitude of a place is called its *meridian*, because, when the sun passes this circle, it is noon in all the places situated under it. Modern nations generally adopt the capitals, or observatories, of their own countries as *First Meridians;* thus the

English reckon from London, or the Royal Observatory at Greenwich, the French from Paris, the Spanish from Madrid, &c. On the celestial globe the meridian is represented by the brass circle perpendicular to the horizon.

1. *Meridian Altitude.* The altitude, or height above the horizon, in degrees, of any celestial object, when it crosses the meridian of a place.

2. *Meridian, Magnetic.* The magnetic meridian, as pointed out by the *mariner's compass*, differs from the geographical (or real north and south) by the amount of the *variation of the compass.* In other words, if we conceive a vertical plane to be drawn through the axis of a magnetic needle when in a state of rest, we have the *magnetic meridian* for the particular place where the needle is. See *Dip of Magnetic Needle.*

MERITHA'LLUS (μέρος, a part, θαλλὸς, a young shoot). The term applied by Du Petit Thouars to the *internodium* of other writers, denoting that portion of the axis of a plant which is between two nodes.

MERO'PIDÆ (*merops*, the bee-eater). The Bee-eaters; a family of the *Insessores*, or Perching birds, belonging to the warmer regions of the Old Continent and its islands; one species visits this country at irregular intervals. See *Fissirostres.*

MERULI'DÆ (*merulus*, a thrush). The Thrushes; a family of the *Insessores*, or Perching birds, in which the point of the beak is not hooked, and the lateral tooth is not so prominent as in the Laniadæ, or Shrikes. See *Dentirostres.*

MESEMBRYA'CEÆ. *Ficoideæ.* The Fig-marigold tribe of Dicotyledonous plants. Succulent shrubs or herbs with showy flowers; *sepals* definite, succulent; *petals* indefinite, linear; *stamens* indefinite; *ovary* many-celled; *capsule* with a starry dehiscence.

MESITE. A liquid existing in pyroxylic spirit, and produced in the distillation of wood. *Mesiten* is a similar product of the same process. *Mesitylene* is a light oily liquid, procured by distilling pyro-acetic spirit (*acetone*) with fuming sulphuric acid.

MESO- (μέσος, middle). The Greek term for *middle*, or that which is situate between others.

1. *Meso-carp* (καρπὸς, fruit). The intermediate part of the pericarp of fruits. When fleshy, it is termed *sarcocarp.* The fibrous portion of the fruit of the cocoa palm is the mesocarp; the eatable part of the cherry or peach is the sarcocarp.

2. *Meso-labe* (λαβεῖν, to take). A mathematical instrument used by Eratosthenes for finding mean proportional lines, required in the problem for the duplication of the cube.

3. *Meso-lite* (λίθος, a stone). Needle-stone; a zeolitic substance, consisting of a hydrated silicate of alumina, lime, and soda, and usually referred to mesotype.

4. *Meso-phlœum* (φλοιὸς, bark). That portion of the bark of plants which lies between the epiphlœum and the endophlœum, or liber. See *Bark.*

5. *Meso-phyllum* (φύλλον, a leaf). The cellular substance of the leaves of plants, also called diachyma and diploë.

6. *Meso-sperm* (σπέρμα, seed). The middle one of the three membranes by which seeds are sometimes enveloped.

7. *Meso-type* (τύπος, form). A silicate of soda and alumina; a simple mineral, white, and needle-shaped; one of the zeolite family, frequently found in trap-rocks. To this are referred the natrolite of Klaproth, the needle-stone of Werner, the mesolite, &c.

META'BOLA (μεταβόλη, change). A term applied by zoologists to those genera of insects which undergo metamorphosis, or pass through the larva, pupa, and imago states of insect existence. See *Ametabola.*

METACE'NTRE (μετὰ, a preposition denoting *change*, κέντρον, a centre). When the position of equilibrium of a floating body has been disturbed, if the vertical line passing through the centre of buoyancy (the line of the *thrust* of the fluid), when produced upward, meets the axis passing through the centre of gravity, the point of intersection is called the *metacentre.*

METAGA'LLIC ACID. A compound obtained by the partial decomposition of gallic acid, when rapidly heated to 480°.

METALLIC DEPOSITS. By this term, geologists denote metallic matters with which the substance of rocks is frequently permeated, in the form of grains, filaments, nodules, irregular plates or veins, and strata or beds. In these cases the metallic matters are supposed to be of contemporaneous origin with the rocks or formations containing them.

META'LLIC VEINS. Metallic ores and mineral substances found in fissures of rocks which are composed of very different materials. They occur chiefly in the primary, and in the lower and middle, secondary rocks; they vary in width from an inch, or less, to several yards, and sometimes extend to many miles. These *veins*, unlike metallic *deposits*, were formed at periods subsequent to the formation of the rocks in which they occur.

METALLO'GRAPHY (μέταλλον, a metal, γράφω, to describe). That branch of science which treats of metals.

ME'TALLOID (μέταλλον, a metal, εἶδος, likeness). A term applied, at first, to the metals obtained from the fixed alkalies and some of the earths. The term is sometimes applied to the inflammable non-metallic bodies, as sulphur, phosphorus, &c.

METALLU'RGY (μέταλλον, a metal, ἔργον, work). The separation of metals from their ores, comprising the operations of assaying, refining, smelting, &c.

ME'TALS (μέταλλον, a mine; a mineral; a metal). A class of elementary bodies, most of which are characterized by their peculiar *metallic lustre*, and, generally speaking, by their great specific gravities. They are divided into different classes, according to their affinity for oxygen, and the peculiar properties of their various oxides. They are distinguished as:—

1. *Perfect Metals.* Those which combine with difficulty with oxygen, and consequently are not easily oxidized; as such, they readily part with oxygen by the simple application of heat, and are converted into pure metals. The best known are platinum, gold, and silver. Mercury holds an intermediate place between these and the next class.

2. *Base Metals.* Those which readily combine with oxygen, partly by mere contact with the atmosphere, or when heated and fused. They are not *reducible* by the application of heat only, but require the admixture of some substance, as coal, to attract the oxygen from the oxide. The best known are iron, copper, lead, tin, and zinc. The metals composing this and the preceding class are termed, from their great specific gravities, the *heavy metals*.

3. *Acidifying Metals.* Those which, entering into combination with oxygen, possess the property of acids, which are hence called metallic acids. These metals are tellurium, arsenic, chromium, molybdenum, tungsten, columbium, and selenium.

4. *Terrigenous Metals.* Those whose oxides yield the *earths*, properly so called. They resist the action of heat, and are insoluble in water. These are aluminum, yttrium, cerium, lantanum, thorium, glucinum, and zirconium.

5. *Kaligenous Metals.* Those which oxidize most readily, their oxides constituting the *alkalies*. These are magnesium, calcium, strontium, barium, lithium, sodium, and potassium. As the metals of this and of the preceding class are some lighter and others but little heavier than water, they are called *light metals*.

METAME'RIC (μετὰ, a preposition denoting *change*, μέρος, a part). A term applied to compounds in which the ultimate elements are the same as in other well-known combinations, but are considered to be arranged in a different way: thus, oxygen, hydrogen, sulphur, and a metal, may be considered as combined in the form of sulphuretted hydrogen and a metallic oxide, or of water (consisting of oxygen and hydrogen) and a metallic sulphuret. See *Isomeric* and *Polymeric.*

METAMO'RPHIC (μετὰ, a preposition denoting *change*, μορφὴ, form). A term applied by Mr. Lyell to the series of crystalline slates which occurs especially in the central ridges of mountain chains. The term denotes that their structure has been changed, since the time of their first formation, by plutonic action. See *Hypozoic System.*

METAMORPHO'SIS (μετὰ, a preposition denoting *change*, and μορφὴ, form). Literally, a change of form. A term employed by Liebig to denote that chemical action by which a given compound is caused, by the presence of a peculiar substance, to resolve itself into two or more compounds; as sugar, by the presence of yeast, into alcohol and carbonic acid.

METAMORPHO'SIS (in Botany). *Morphology.* These terms denote a theory, according to which the several organs of plants are referred to a typical organ, varying in their modes of development, not on account of any original difference in structure, but on account of especial, local, and predisposing causes. In the words of Göthe, the originator of the theory, plants "develop themselves out of themselves progressively."

METAMORPHO'SIS (in Zoology). A term denoting a series of changes which insects undergo, both in their outward form and their internal structure, before they arrive at their perfect condition. The successive states of existence are the *larva*, or caterpillar; the *pupa*, nymph, or chrysalis; and the *imago*, or perfect state.

Fabricius distinguishes five kinds of metamorphosis. 1. The first class comprises all those insects in which the pupæ, being entirely without legs, are absolutely motionless, as in the common house-fly; these are called *coarctate*. 2. The second kind occurs in the Lepidoptera, and is termed *obtected*. It is seen in the silk-worm, which wraps itself in a silken ball, throws off its last skin, and becomes a quiescent pupa. 3. The third kind of metamorphosis is termed *incomplete*, and it occurs in the hymenopterous and in many coleopterous insects, in which the larva is deprived of feet or other external organs, or possesses these parts in a very imperfect condition; in the pupa, however, they are perfectly distinct. 4. A *semi-complete* metamorphosis occurs in those insects whose larva only differs from the imago in not being possessed of wings. 5. Metamorphosis is *complete*, when the perfect insect does not acquire wings at all, but precisely resembles the pupa.

METAPHY′SICS (*μετὰ*, beyond, *φύσις*, nature). A vague term, simply denoting the science of objects beyond that which is physical and sensible. Generally speaking, metaphysics is a science purely speculative, which investigates the ultimate grounds of being, irrespectively of experience. In this country it usually denotes the philosophy of mind, as distinguished from that of matter.

ME′TAPLASM (*μεταπλασμὸς*, transformation). In Grammar, the *assumption* of a present or nominative for the derived tenses of verbs or cases of nouns, as *πέσω* for *ἔπεσον*, *τὸ δένδρος* for *δένδρεσι*.

METEMPSYCHO′SIS (*μετεμψύχωσις*, the transferring of the soul from one body to another). The transmigration of the soul; a philosophical or religious system taught by Pythagoras, and embraced by the Hindus, Egyptians, and other nations. According to this doctrine, the soul passes into different bodies, undergoing a series of degradations or exaltations, until it becomes reunited with the Supreme Being, with which it is identified, "as a river at its confluence with the sea merges therein altogether."

METEO′RIC STONES (*μετέωρος*, floating in the air). *Aerolites*. Stones or mineral masses which have fallen through the air, accompanied with the disengagement of light and a noise like thunder. They are composed of silica, iron, and magnesia, with small proportions of alumina, lime, nickel, chrome, and sulphur.

METEORO′LOGY (*μετέωρος*, floating in the air, *λόγος*, a description). Literally, the science of meteors; but the term is applied, more extensively, to the investigation of all the physical causes which affect the condition of our globe; and particularly to the effects of light and heat on the earth, the ocean, and the atmosphere, and the results of these agents in the production of climate.

ME′THYL (*μέθυ*, wine, *ὕλη*, wood). The newly-discovered radical, or basyle, of wood spirit. *Methylic ether* is a colourless gas, the oxide of methyl. *Methol* is a liquid produced in the distillation of wood.

ME′TONYMY (*μετωνυμία*, the using of one word for another). A rhetorical figure, by which an idea is represented by a related idea, as substance by quality, precedent by subsequent, effect by cause. Thus: "I am *Sir Oracle*," for, I am infallible. Again: "His *silver hairs* will purchase us a good opinion."

METOPO′SCOPY (*μέτωπον*, the forehead, *σκοπέω*, to examine). The art of divining by inspection of the forehead; practised among the Romans, and in the middle ages.

METRE. The French standard measure of length, equivalent to 39·371, or very nearly 39⅜ English inches. The French measures ascend and descend in a decimal progression. Thus,

	English Inches.
A Millimetre is	·03937
Centimetre	·39371
Decimetre	3·93710
Metre	39·371
Decametre	393·71
Hecatometre . . .	3937·1
Chiliometre . .	39371

ME′TRONOME (*μέτρον*, a measure, *νόμος*, a musical strain). A short pendulum used by musicians for marking time, which may be made to vibrate quickly or slowly as occasion requires; the movements of the pendulum are regulated by wheels and a spiral spring.

MIA′RGYRITE. A sulphur-salt, first separated by Mohs from red silver, under the name of hemiprismatic ruby-blende.

MI′ASCITE. A columnar variety of bitterspar, intermixed with asbestos, from Miaska in Siberia.

MICA (*mico*, to shine). A simple mineral, having a shining silvery surface, and capable of being split into very thin elastic leaves or scales. It consists principally of flint and clay, with a little magnesia and oxide of iron. It is commonly called *talc*, but mineralogists apply this term to a different mineral. The brilliant scales in granite are mica. The varieties which have been examined with reference to their optical properties and chemical constitution, are *potassa-mica*, the most common variety, which has two axes; *magnesia-mica*, which has but one axis; and *lithia-mica*, including lepidote and several large-foliated varieties of what was formerly called common mica.

MICA-SLATE or SCHIST. *Micaceous schistus.* One of the metamorphic or crystalline stratified rocks, of the hypogene class, which is characterized by being composed of a large proportion of mica united with quartz. This rock is termed *laminar*, when the mica occurs in continuous laminæ, alternating with layers of quartz; *granular laminated*, when the plates of mica are formed of scales, and those of quartz of granules or crystals; *porphyritic*, when either of the preceding varieties contains crystals of hornblende, felspar, or garnet.

MICA'CEOUS ROCKS. Rocks of which *mica* is the chief ingredient: these are mica-slate and clay-slate. Though few in number, they are extensively distributed.

MI'CROCOSM (μικρὸς, small, κόσμος, world). A term fancifully applied by the ancient philosophers to man, from an idea of his resemblance in miniature to the macrocosm, or great world.

MICROCO'SMIC SALT. A triple salt, consisting of the phosphates of soda and of ammonia, employed as a flux in experiments with the blow-pipe.

MICRO'METER (μικρὸς, small, μέτρον, a measure). An instrument adapted to a telescope, for the purpose of measuring small distances, or the diameters of objects which subtend very small angles, as those of the celestial bodies.

MICRO'PYLE (μικρὸς, small, πύλη, a gate). The botanical designation of the foramen of the ripe seed, comprising the exostome and the endostome of the ovule, which lead to the internal portion of the ovule, or the nucleus.

MI'CROSCOPE (μικρὸς, small, σκοπέω, to view). An instrument for furnishing magnified images of objects so minute that, when held at the distance of distinct vision, viz., from eight to ten inches of the eye, the unassisted eye is incapable of distinguishing their form and component parts. This end is obtained by enlarging the angle of vision.

1. The *single microscope* consists of a convex lens, with a very short focal distance. If an object be viewed through it at less than its focal distance, but near to the focus, the rays transmitted through the lens will be rendered more convergent, and an eye on which they fall will see the object under a greater angle of vision, *i. e.* it will see the object magnified.

2. The *compound microscope* consists of two or more convex lenses, or of a combination of concave specula and lenses. The former is termed a *dioptric* or *refracting*, the latter a *catoptric* or *reflecting* microscope. 1. In its simplest form, the refracting microscope consists of only two convex lenses, that nearest to the object being called the *object-glass*, the other the *eye-glass*. 2. In reflecting microscopes, the place of the object-glass is occupied by a concave speculum, which also produces an inverted image.

3. The *solar microscope* is nothing more than a magic lantern, the light of the sun being used instead of that of a lamp. It consists of two lenses, one of which is called the *condenser*, because it is employed to concentrate the rays of the sun, in order to illuminate more strongly the object to be magnified. The other is a double convex lens, of considerable power, by which the image is formed. To these is added a plane mirror, for reflecting the rays of the sun on the condenser.

4. The *oxy-hydrogen microscope* is an instrument in which, instead of the light of the sun or of a lamp, an intense light is employed, by means of the combustion of a piece of lime in a stream of oxy-hydrogen gas. A cylinder of the ignited lime, of half an inch in diameter, diffuses a light greater than that yielded by 153 wax candles.

MI'CROSCO'PIUM. The Microscope; a modern southern constellation, consisting of ten stars.

MICROZOA'RIA (μικρὰ ζῶα, small animals). The designation given by De Blainville to the infusory animalcules of the earlier writers. They are distinguished into the *heteropoda* and the *apoda*, the former comprising the sections rotiferæ and ciliiferæ, the latter having no external appendages.

MID-HEAVEN. An astronomical term for that point of the ecliptic which is on the meridian at any given moment.

MIDDLE EPOCH. A geological epoch characterized by the presence of the new red sandstone, a formation consisting of sand and marl, with rare local interpolations of limestone. See *Geology*.

MIDDLE LATITUDE SAILING. A nautical term employed in estimating the difference of longitude by means of the differences of latitude and the intermediate *departure;* this departure is supposed to be an arc of a parallel of longitude at the *intermediate* or *middle latitude*.

MIDDLE TERM. In a logical syllogism, the *middle term* (called by the older logicians "argumentum") is that with which each of the other terms, the major and the minor, is separately compared, in order to judge of their agreement or disagreement with each other.

MI'DRIB. *Costa.* The midrib of a leaf is the principal vein, which forms a continuation of the petiole and the axis of the leaf; from this all the other veins diverge, either from its sides or its base.

MI'EMITE. A variety of Werner's rhomb-spar, or magnesian limestone, found at Miemo in Tuscany, imbedded in gypsum. There are two kinds of miemite, the granular and the prismatic.

MILDEW. A disease in plants, caused by the ravages of parasitic fungi.

MILE, GEOGRAPHICAL. Every degree of *latitude* contains 60 geographical miles, and these are always understood to be used, unless other miles are specified. They must not be confounded with the *British statute mile*, which is the common itinerary measure of our country, and $69\frac{1}{8}$ of which are contained in a degree of latitude. Hence a great circle contains only 21,600 *geographical* or *nautical* miles, whilst it contains 24,869 *common* or *statute* miles; or, a common mile is to a geographical mile as 21,600 to 24,869. To express this proportion in feet, we must say,

21,600 : 24,869 :: 5280 ft. : 6079·089 ft.

Hence a geographical or nautical mile is about 6079 English feet.

MILK QUARTZ. *Rose quartz.* A sub-species of rhomboidal quartz, with a milk-white or rose-red colour, found in Bavaria in beds of quartz in granite. It is probably silica, coloured by manganese.

MILK VESSELS. *Laticiferous tissue.* A peculiar tissue, consisting of branched anastomizing tubes, lying in the bark or near the surface of plants, and containing a milky juice. They are also called *vital vessels*, vessels of the latex, &c. See *Cinenchyma.*

MILKY WAY. An astronomical term applied to that great luminous band which stretches across the sky, from horizon to horizon, and which, when examined through powerful telescopes, is found to consist entirely of stars scattered by millions, like glittering dust, on the black ground of the general heavens.

MILLEPO'RIDÆ (*mille*, a thousand, *porus*, a pore). A tribe of lithophytous polyps, comprising those in which the calcareous axis is perforated by numerous conical pores.

MILLSTONE GRIT. A coarse sandy grit, unlike the old red sandstone, frequently replacing or covering up the coral limestones in many parts of England and Ireland.

MI'NERAL. A *simple mineral* is a homogeneous substance, whether simple in an elementary point of view or not, which presents itself in certain definite forms, and has a texture, mode of breaking, and other physical properties, as hardness and colour, by which it may be distinguished from all other substances. The science which treats of these substances is called *mineralogy*, by some *oryctognosy;* while to *geology* belongs, among other subjects, the consideration of their aggregation into *rocks*, which, in a geological sense, are masses of mineral matter, of sufficient extent to constitute an essential portion of the solid part of the globe.

1. Minerals are termed *crystalline*, when they assume particular symmetrical forms, as that of a cube or a prism; *amorphous*, when they occur in no definite form.

2. The *hardness* of minerals is the resistance which they oppose to the separation of their parts. Under this head (p. 159) the mode of testing their hardness is explained. Their *fragility* denotes the comparative ease with which they may be fractured; their *friability*, an imperfect state of aggregation, rendering them easily divisible into grains.

3. The *fracture* of minerals, or the surface exposed when they are broken by a hammer, varies considerably: it may be even, splintery, scaly, or conchoidal—that is, concave like a shell.

4. Minerals are *transparent*, when they allow sufficient light to pass through them to enable a body to be distinguished when placed behind them; *translucent*,

when they admit light, but are not transparent; *opaque*, when they transmit no light, even when reduced to a finely laminated state. The *lustre*, or degree in which the surface of minerals reflects light, is various: it may be glimmering, glassy, pearly, resinous, silky, metallic, adamantine.

5. The *texture* of minerals is regular or irregular; *lamellar*, when it presents the appearance of thin plates; *fibrous*, when composed, as it were, of threads or filaments; *radiating*, when the fibres converge towards a point.

MINERAL CAOUTCHOUC. A variety of bitumen, resembling caoutchouc in elasticity and softness, and in removing pencil-marks.

MINERAL CHARCOAL. A fibrous variety of non-bituminous mineral coal.

MINERAL GREEN. A hydrated subcarbonate of copper, used as a pigment.

MINERAL YELLOW. *Patent yellow.* A pigment consisting of chloride and protoxide of lead.

MINERALIZATION. The process of converting a substance into a mineral. A metal combined with oxygen, sulphur, &c., loses its metallic properties, and becomes *mineralized.* The latter bodies are then termed *mineralizers:* thus, in the native oxides, oxygen is called the mineralizer; in the ores of lead and copper, sulphur is the mineralizer, &c.

MINERA′LOGY. The science which relates to the accurate description, and natural classification of minerals. That branch of the subject which relates to the arrangement of the descriptive characters of minerals, for the purpose of distinguishing them from one another, is more properly an art.

MI′NIMUM (superl. of *parvus*, small). The least possible quantity or effect, as opposed to *maximum*, or the greatest possible.

MI′NIUM. Red lead or vermilion; an oxide of lead, of an intensely red colour, employed as a pigment. *Native minium*, from Hessia, Siberia, &c., is probably produced by the decomposition of galena.

MINOR TERM. In Logic, the *minor term* of a categorical syllogism is the subject of the conclusion. The *minor premiss* is that which contains the minor term. In hypothetical syllogisms, the categorical premiss is called the minor.

MINUTE. The sixtieth part of a degree of a circle. Minutes are denoted by one acute accent, thus (′); the second, or sixtieth part of a minute, by two such accents (″); and the third by three (‴). See *Hour.*

MI′OCENE (*μείων*, less, *καινὸς*, recent). A division of tertiary strata, intervening between the Eocene and Pliocene formations; so called, because a minority of its fossil shells are referable to living species.

MIRACH, or β ANDROMEDA. A star of the second magnitude, in the constellation Andromeda.

MIRAGE. A meteorological phenomenon, depending partly on the vapour of the atmosphere, and partly on the intermixture of strata of air of different temperatures and densities. It assumes the appearance of a sheet of water, often exhibiting the reflected or inverted images of distant objects. This unusual refraction frequently occurs when there intervenes between the spectator and the objects an expanse of smooth water, as on the Oldenburg coast of the North Sea, where it is called *Kimmung;* or as at the Straits of Messina, where it is called *Fata Morgana.*

MIRROR (*mirer*, French, to look at). Any polished body which is impervious to the rays of light, and reflects them equally, so as to exhibit the images of objects placed before it. When formed of metal, it is sometimes termed *speculum*, the Latin term for a looking-glass.

1. *Plane Mirror.* That which has a *plane* surface, as the common looking-glass.

2. *Concave Mirror.* That which has a hollow surface, which collects the rays and reflects them to a focus in front of the mirror, thereby enlarging the image of the object.

3. *Convex Mirror.* That which has a convex surface, which disperses the rays, and consequently diminishes the image of the object. These *concave* and *convex* surfaces are formed of different curves, according to the purposes intended, and may be *spherical*, *parabolic*, or *elliptical.* Mirrors with mixed surfaces are either *cylindrical* or *conical.* See *Burning-glass.*

MISPI′CKEL. Arsenical pyrites; an arsenio-sulphuret, some varieties of which, containing accidentally admixed silver, constitute Werner's *weiss-ertz.*

MIST. A meteorological phenomenon, occasioned by the vapour of the atmosphere becoming visible; and this is a consequence of the temperature of the air being reduced below that of the vapour.

MISY. A designation of green vitriol, or sulphate of iron, as it occurs in the form of yellow scales, in the Hartz.

MI'TRINÆ. Mitre-shells; a subfamily of the *Volutidæ*, or volutes, named from the typical genus *mitra;* the spire is always acute, generally longer than the aperture, and the lower plaits smallest; the foot is small, not dilated on the sides, and the siphon rather long.

MIXTURE and COMPOUND. In a chemical *mixture*, the aggregate particles can be separated by mechanical means, and the proportion of the different constituents determined; in a chemical *compound*, no mechanical power can separate the constituent particles: a new substance is formed, which possesses no properties in common with the original ingredients.

MNEMO'NICS (μνημονικὸς, belonging to memory). A term applied to any system in which the memory of particular objects is exercised by artificial means. The principle of all such systems is, to associate in our minds two notions, one of which is more easily remembered than the other, but, in consequence of the association, is always followed by that other.

MOBI'LITY (*mobilis*, moveable). A property of matter by which it is capable of being put into motion by the action of a force which is sufficient to overcome its inertia.

MOCHA STONE. A translucent chalcedony, containing dark outlines of arborization, like vegetable filaments, and named from Mocha, in Arabia, where it is chiefly found.

MODAL. In Logic, a *modal* categorical proposition is one which asserts that the predicate exists in the subject in a certain mode or manner, as "accidentally," "wilfully," &c.

MODERN EPOCH. In Geology, the present period comprehends all those deposits which owe their origin to causes now in action, and has reference to the phenomena which are taking place at the surface of the earth. See *Geology*.

MO'DULUS. 1. In the theory of *logarithms*, the modulus is the number by which all the logarithms in one scale of notation must be multiplied, in order to adapt them to the same number of another scale. Thus the modulus of conversion between the common logarithms and the Napierean or hyperbolic scale, is 0·43,429,448. 2. In *Physics*, the modulus of *elasticity* is a numerical co-efficient, which is constant for the same body, but variable for different bodies; and which has no influence on the law of elasticity, though it serves to measure its effects.

MO'HSITE. Crystallized titaniate of iron, found in Dauphiny.

MOIRE'E METALLIQUE. Crystallized tin-plate, obtained by pouring on heated tin-plate a mixture of two parts of nitric acid, and three of muriatic acid diluted with eight parts of water. When varnished, it is worked into ornamental vessels.

MOLA'SSE (*molle*, French, soft). A provincial name for a soft green sandstone, associated with marl and conglomerates, belonging to the Miocene Tertiary Period, extensively developed in the lower country of Switzerland.

MOLE'CULAR ATTRACTION. That mode of attraction which operates upon the particles, or *molecules*, of a body, as distinguished from the attraction of gravitation. According to the molecular theory, all bodies are viewed as aggregates of minute particles, atoms, or molecules, and are formed by the attractive and repulsive forces acting on them at immeasurably small distances.

MOLECULE (dim. of *moles*, a mass). A minute particle of a mass or body. It differs from *atom*, in being always considered as a portion of some aggregate.

1. *Complex organic molecule.* An association of two or more binary compounds, comparatively simple in constitution, often isolable substances and possessed of considerable stability.

2. *Integrant molecules.* The name given by Haüy to the last particles into which the nucleus of a crystal can be mechanically divided.

3. *Molecules, active.* Minute moving particles, found in all vegetable matter when rubbed in pieces and examined under a powerful microscope.

MO'LISITE. The mineralogical name of the crystallized titaniate of iron of Dauphiny.

MOLLU'SCA (*mollis*, soft). A term employed by Cuvier to designate the fourth grand division of the animal world, and founded upon the unimportant circumstance that the beings to which it is applied have soft bodies, unsupported by any internal or tegumentary framework of sufficient density to merit the name of skeleton. These animals belong to the *Hetero-gangliata* of Owen, the *Cyclo-gangliata* of Grant. See *Zoology*.

MOLYBDE'NUM (μόλυβδος, lead). A

white metal closely allied to tungsten. Its name was derived from the resemblance of its native sulphuret, or *molybdena-glance*, to lead.

MOLY'BDIC ACID. *Ochry molybdenum.* An acid obtained from the native sulphuret of molybdenum, in the form of a yellow powder. Its salts are termed molybdates. The *molybdate of lead*, or yellow lead ore, occurs as a massive mineral, lamelliform, and crystallized in splendid groups on compact limestone, &c.; chiefly from Bleiberg in Carinthia.

MOME'NTUM. A term in physics signifying the force of percussion, or the intensity of a moving body; and this is always equal to the *quantity of matter multiplied into the velocity.* Thus, a ball of four pounds' weight, moving at the rate of eighteen feet in a second, has double the momentum of a ball of three pounds' weight, moving at the rate of twelve feet per second, for 4 × 18 is double of 3 × 12.

If the momenta of two or more forces, acting in opposite directions on a solid body, be equal, the body will continue at rest; and this condition is called the equilibrium, or *statical momentum of the forces.*

MON-, MONO- (*μόνος*, single, alone). A Greek prefix, denoting *unity.*

1. *Mon-adelphia* (ἀδελφὸς, a brother). The sixteenth class of plants in the Linnæan system, in which the filaments are all united into one tube.

2. *Mon-andria* (ἀνὴρ, a man). The first class of plants in the Linnæan system, containing only one stamen.

3. *Mono-carpous* (καρπὸς, fruit). Bearing fruit only once, and dying after fructification, as wheat. This is the character of what are commonly called annual plants, and of a few others, which, like the American aloe, although they may live for many years, produce flowers and fruit only once, and then die.

4. *Mono-ceros* (κέρας, a horn). The Unicorn; a modern southern constellation, consisting of thirty-one stars.

5. *Mono-chlamydeæ* (χλαμὺς, a tunic). A sub-class of exogenous plants, in which the flowers have only one envelope, viz. a calyx.

6. *Mono-chord* (χορδὴ, a string). *Sonometer.* An apparatus for exhibiting the phenomena of sonorous bodies and the ratios of their vibrations. In its most simple construction, it consists of a single string of wire or catgut strained by means of two pins across two wooden bridges, which are fastened into a strong board; the part of the board beneath the string is graduated, so that the latter may be readily made to vibrate in any required number of parts.

7. *Mono-chroite.* Subsesquichromate of lead; one of the ores containing chromium, occurring with chromate of lead in the Ural.

8. *Mono-chromatic* (χρῶμα, colour). Having only one colour; a term applied to a lamp which, being fed with certain substances, yields a flame of only one colour; and, hence, all objects viewed by this light are deficient in those varied hues which they reflect when viewed by solar light or that from ordinary combustibles.

9. *Mono-cotyledons* (κοτυληδὼν, a seed-lobe). Plants which have only one cotyledon, or seed-lobe. This structure of the embryo corresponds with the endogenous structure of the stem; and hence, monocotyledon and endogen are convertible terms.

10. *Mon-œcia* (οἶκος, a house). The twenty-first class of plants in the Linnean system, in which the stamens and pistils grow on separate flowers, but on the same individual, as in hazel, birch, oak, &c.

11. *Mono-gram* (γράμμα, a written letter). A mark or cipher consisting of one letter, which is formed by the interlacing of two or more letters, employed as an abbreviation, especially on ancient coins.

12. *Mono-gynia* (γυνὴ, a female). The name given by Linnæus to those orders of plants, in which each flower contains only one pistil.

13. *Mono-lith* (λίθος, a stone). A pillar consisting of a single stone, as the obelisk of Luxor, the Zodiac of Denderah, &c.

14. *Mono-mera* (μέρος, a part). A section of homopterous insects, in which the tarsi have only one joint, as in the *Coccidæ*, or Scale Insects.

15. *Mono-morphous* (μορφὴ, form). Of a single form; a term proposed by Mr. Westwood for certain neuropterous insects, which, in their larva state, are similar in form to the perfect insect, though wingless.

16. *Mono-myaria* (μῦς, a muscle). A general name for bivalves, whose shell is closed by a single adductor muscle, as in the oyster and the pecten. See *Dimyaria.*

17. *Mono-neura* (νεῦρον, a nerve). A

name given by Rudolphi to those animals which were supposed to possess only the ganglionic system of nerves, as the mollusca and the insects.

18. *Mono-petalous* (πέταλον, a leaf). Having a single petal, as applied to the corolla of plants. The difference, however, between a mono-petalous and a poly-petalous corolla is, that in the former the leaves are united, whereas in the latter they are distinct. A more proper term for the former is *gamo-petalous*, which indicates cohesion.

19. *Mono-phyllous* (φύλλον, a leaf). A term sometimes employed as synonymous with *monosepalous*, and denoting cohesion of the sepals, or a gamosepalous calyx.

20. *Mono-pleurobranchians* (πλευρὰ, the side, βράγχια, gills). An order of the Paracephalophora, in which the branchiæ are more or less completely covered by a portion of the mantle, and situated on the right side of the body.

21. *Mono-sepalous.* Having a single sepal, or calyx-leaf. The term *gamosepalous* is preferable, for the reason assigned under the term mono-petalous.

22. *Mono-thalamous* (θάλαμος, a chamber). A term applied to a shell which forms a single chamber, as that of the argonauta.

23. *Mono-thyra* (θύρα, a door). A term applied by Aristotle to all spiral univalve shells. See *Dithyra.*

24. *Mono-tremata* (τράω, to bore a hole). An order of Mammalia, characterized by the presence of a common cloacal outlet for the excremental and the generative products. They are ovo-viviparous animals, being intermediate between the truly viviparous mammalia, and the oviparous birds and reptiles. The order contains only two species, the *echidna* or spiny ant-eater, and the *ornithorrhynchus* or duck-billed platypus.

MONAD (μονὰς, unity). The smallest of all visible animalcules, spoken of by Buffon and his followers as constituting the elementary molecule of organic beings. Ehrenberg computed that a single drop of liquid may contain 500,000,000 monads, a number equal to that of all the human beings on the surface of the globe.

1. *Monad of the Physiologists.* An elementary particle of an organic body. Thus, the primary cell or germ from which all the other cells of the brain are produced, is termed the *primary monad;* and the secondary cells or particles, produced by this, are termed *secondary monads.*

2. *Monad of the Metaphysicians.* An active kind of principle, endued with perception and appetite, ascribed to each elementary particle of matter. The mutual reaction of the mind and body upon each other, accordingly, consists of the action of the mental monad upon the internal states of the monads of the body, and *vice versâ.*

MONGOLIAN RACE. One of the five principal races of mankind, in which the head is almost square, the cheek-bones projecting *outwards*, the nose flat, the face broad and flattened, with the parts imperfectly distinguished, the internal angle of the eye depressed towards the nose.

MO'NITOR. An animal of the saurian or lizard tribe, some species of which are found in both the fossil and the recent state.

MONS MENELAUS. A modern northern constellation consisting of eleven stars.

MONSOO'NS (*mooseem*, Malay, a season). Periodical winds, which blow half the year from one quarter, and the other half from the opposite direction. From April to October a *south-west* wind prevails north of the equator, southward of this a *south-east* wind; from October to April, a *north-east* wind prevails north of the equator, and a *north-west* between the equator and 10° of south latitude. The monsoons occur in the Bay of Bengal, the Arabian Sea, the Mozambique Channel, on the coasts of Sumatra and Java, along the coast of China, and off the western coast of New Holland.

MONTGOLFIER. An air-balloon, or aërostat, made of paper, with a large opening below, where fire is applied for the purpose of rarefying the contained air, until it is of less specific gravity than the atmospheric air. It is named from its inventor.

MONTH. 1. The *average sidereal* month, or complete circuit of the heavens, comprises a period of 27d. 7h. 43m. 11.5s. 2. The *average lunation*, common month, or interval between two conjunctions with the sun, consists of 29d. 12h. 44m. 2.9s. 3. The *average anomalistic* month, or revolution from perigee to perigee, consists of 27d. 13h. 18m. 37.4s. 4. The *average tropical* month, or period from the vernal equinox to the vernal equinox again (the equinox being in retrograde motion), consists of 27d. 7h.

43m. 4.7s. 5. The *average nodical* month, or interval of time from a node to a node of the same kind, comprises 27d. 5h. 5m. 36.0s. The quantities of these months are here reckoned in mean solar days.

MONTMA'RTRITE. A yellowish massive mineral, found at Montmartre, near Paris, consisting of the sulphate and the carbonate of lime.

MOOD (in Grammar). A mood expresses the *manner* in which the action or state denoted by the verb exists, as being certain, contingent, &c.

MOOD (in Logic). The mood of a categorical syllogism is the designation of its three propositions, in the order in which they stand, according to their quantity and quality. Only eleven moods can be used in a legitimate syllogism.

MOON. A heavenly body which moves round the earth in the period of a lunar month, accompanying the earth, as a satellite, in its orbit round the sun. The average distance of the moon from the earth is 237,000 miles.

MOON-CULMINATING. A term applied, in astronomy, to those *stars* which pass the meridian soon before or after the moon. In the nautical almanac, these stars are selected for each day, and their right ascensions are given for their Greenwich meridian transits.

MOONSTONE. *Adularia.* Naker felspar, principally found on Mount St. Gothard. It is the famous *petuntse* of the Chinese, which constitutes the vitrifying ingredient of their porcelain. The fine variety from Ceylon, when cut *en cabochon*, is called moonstone. See *Sunstone.*

MORAINE. A mass of debris accumulated along the anterior edge and lateral margins of some of the larger glaciers, in the form of a long dyke or parapet, called in the Tyrol *trockne muren*, and in Savoy *moraine*. In Iceland, where the glaciers are called *jokül*, the moraines are called *jokülsgiärde*.

MORDANT (*mordeo*, to bite). A substance employed in dyeing, which has an affinity both for the colouring matter and for the stuff to be dyed; the combination of the colour with the texture of the stuff is thus aided by a kind of double decomposition. These substances were supposed, in the infancy of the art, to seize the fibres by an agency analogous to that of the teeth of animals.

MO'ROXITE. Norwegian apatite; a phosphate of lime, of a blue-green colour, occurring native in combination with fluoride of calcium, in the form of hexagonal prisms.

MORO'XYLIC ACID (*μόρον*, the mulberry, *ξύλον*, wood). *Moric acid.* An acid procured from the bark of the mulberry-tree, forming compounds with salifiable bases, called *moroxalates.*

MO'RPHIA (*Morpheus*, the god of sleep). A vegetable alkali existing in opium, of which it constitutes the narcotic principle.

MORPHO'LOGY (*μορφὴ*, form, *λόγος*, a description). The history of the modifications of form which the same organ undergoes in different animals or plants. See *Metamorphosis.*

MORTAR CEMENT. A mixture of lime and siliceous sand, the former being in the state of hydrate or slaked lime. *Hydraulic mortar* is obtained from concretionary masses found in marl, and also in the form of isolated blocks in the bed of the Thames.

MOSAIC GOLD. (*aurum musivum*). The alchemical name of the bisulphuret of tin. It is produced in fine flakes of a beautiful golden colour, and is used as a pigment.

MOSASAU'RUS. The saurian of the Meuse; a gigantic extinct aquatic lizard, nearly allied to the monitor, and found in the cretaceous series, chiefly on the banks of the Meuse.

MO'SCHIDÆ (*moschus*, the musk deer). The Musk Deer tribe; a family of the *Ruminantia*, differing little from the rest of the order, except in the absence of horns.

MO'SCHUS. A quadruped resembling the chamois or mountain goat, from which the perfume musk is obtained.

MOTACILLI'NÆ (*motacilla*, the wagtail). Motacilline birds, or Wag-tails; a family of the *Cantatrices* of Mac Gillivray, with slender form, rather short neck, and oblong head; readily distinguished from the allied families by the elongated tail and peculiar form of the wings.

MOTHER OF PEARL. A term applied to shells composed of alternate layers of coagulated albumen and carbonate of lime.

MOTHER WATER. The liquid which remains when sea water, or any other solution containing various salts, has been evaporated, and the crystals removed. The mother water contains deliquescent salts, and any existing impurities.

MOTION. The continued change of

place of a body, or of any *parts* of a body; for, in the cases of a globe turning on its axis, and of a wheel revolving on a pivot, the parts of these bodies change their places, while the bodies themselves remain stationary.

1. *Uniform motion* is that of a body which passes over equal spaces in equal times. It is produced by a force having acted on a body once, and having ceased to act, as the stroke of a bat on a cricket-ball. Were there no opposing force, as gravity, the motion of such a body would be uniform.

2. *Retarded motion* is produced by some force acting on a body in a direction opposed to that which first put it in motion, and thus gradually diminishing its velocity.

3. *Accelerated motion* is produced when the force which puts a body in motion continues to act upon it during its motion, so that its velocity is continually increased.

4. In cases of accelerated and of retarded velocity, a distinction is observed between the *initial* and the *final velocity* of a body: the former is exhibited by the body when it commences its motion; the latter only after the lapse of a certain time: both are measured by the space which the body would have passed over, in one second, with the uniform initial or final velocity, as the case may be.

5. *Reflected motion* is produced when a body is turned out of a straight line by some force independent of gravity; it is the result of re-action being contrary to action. If a ball be thrown against a wall, it rebounds, in consequence of the re-action of the wall against which it is struck, and it is said to have *reflected motion.*

6. *Simple motion* is that which results from the operation of a single force. But when two or more forces act in different directions on the same body, at the same time, the motion so produced is called *compound;* and the single force which represents the combined effects of all the forces, is called the *resultant.*

7. *Circular motion* is the motion of a body in a ring, or circle, and is produced by the action of two forces. By one of these forces the moving body tends to fly off in a straight line, while by the other, it is drawn towards the centre, and thus it is made to revolve, or move round in a circle. The force by which a body tends to go off in a straight line is called the *centrifugal force;* that which draws it towards the centre, is called the *centripetal force.*

8. In *curvilinear motion* the direction of the body is neither straight forward nor diagonal, but through a line which is curved. This kind of motion may be in any direction; but when it is produced in part by gravity, its direction is always towards the earth. A stream of water from an aperture in the side of a vessel, as it falls towards the ground, is an example of a curved line; and a body passing through such a line, is said to have *curvilinear* motion.

9. It may happen that an object is in motion, as well as the spectator, in which case, the motion of the latter is transferred to the former, and the whole motion of the object, compounded of that which it has of its own, and that which it appears to have from the motion of the spectator, is called the *apparent* or *relative* motion.

MOTION, CENTRE OF. That point which remains at rest, while all the other parts of a body move about it.

MOUNTAIN. A considerable elevation of the surface of the earth, attaining a height of more than two thousand feet. A *chain* of mountains is, strictly speaking, a series of which the bases are continuous. A *hill* is merely a small mountain, and the lowest elevations of this kind are called *hillocks* or mounds. A mountain of a conical form, with the summit narrow, is named a *cone;* when of the same form, but more massy, and with the summit depressed and rounded, it is a *dome;* these are of volcanic origin. See *Platform* and *Peak.*

MOUNTAIN BLUE. Blue copper, or carbonate of copper, the more remarkable varieties of which are those from Chessy, and from the Bannat, combined with various substances. *Mountain green* is the common copper green, also a carbonate.

MOUNTAIN CORK. The elastic variety of asbestos. *Mountain leather* is the tough variety. When it occurs in very thin pieces, it is called *mountain paper.* The ligniform variety is named *mountain* or *rock wood.*

MOUNTAIN LIMESTONE. *Carboniferous limestone.* A series of limestone strata of marine origin, usually forming the lowest member of the coal measures.

MOUNTAIN SOAP. A mineral substance found in the island of Skye, and employed in crayon painting.

MOUNTAIN TALLOW. A curious

mineral with the colour and feel of tallow, found in a bog on the borders of Loch Fyne in Scotland, and in one of the Swedish lakes. It differs from every known class of bodies. In volatility and combustibility it resembles naphtha.

MOYA. A term applied in South America to mud poured out from volcanoes during eruptions.

MUCIC ACID. An acid first obtained from sugar of milk, and hence termed *saccholactic;* but as all the gums appear to yield it, and the principal acid in the sugar of milk is the oxalic, it is now called *mucic*.

MUCUS. One of the primary animal fluids, perfectly distinct from gelatin.

MUDSTONE. A local name for part of the Upper Silurian Rocks of Mr. Murchison.

MUFFLE. A small earthen oven, fixed in a furnace, and used in cupellation, and other processes which require the access of air.

MUGI'LIDÆ (*mugil*, the mullet). The Mullet tribe; a family of acanthopterygious fishes, including the genera mugil, tetragonurus, and atherina. This family is included in the cycloid order in the system of Agassiz.

MULLER'S GLASS. Another name for *hyalite*, a siliceous substance found in fissures in vesicular basalt and basaltic greenstone.

MULTILATERAL (*multa latera* habens). Having many sides; as applied to a geometrical figure, bounded by more than four straight lines. See *Polygon*.

MULTILOCULAR (*multos loculos* habens). Having many loculi or chambers; a term applied to those shells which, like the nautilus and ammonite, are divided into many compartments.

MULTINO'MIAL (*multa nomina* habens). Having many terms; an algebraical expression denoting a quantity which consists of an indefinite number of terms, as $a + b - c + x - y$, &c. Such a quantity is also termed a *polynomial*.

MU'LTIPLE (*multiplex*, manifold). A number which includes another a certain number of times; thus 6 is a multiple of 3 or of 2; 18 is a multiple of 9 or of 6. Hence, any number of *equal* magnitudes added together give a multiple of any one of them; thus 6 + 6 + 6, or 18, is a multiple of 6. See *Submultiple*.

Least common multiple. A *common* multiple of two or more numbers is one which contains each of them; and, of course, the *least* such number is their *least common multiple*. Thus 6, 12, 18, &c. are all common multiples of 2 and 3; but 6 is their *least* common multiple; 12, 24, 36, 48, &c. are all common multiples of 2, 3, 4, 6, and 12; but 12 is their least common multiple.

MULTIPLE POINTS. In Geometry, when two or more branches of a curve pass through the same point, this is called a multiple point; and it is equally so called, whether the branches touch or cut one another.

MULTIPLICAND. That factor, number, or quantity in multiplication, which is to be repeated the number of times denoted by the other factor, or the multiplier.

MULTIPLICATION. The arithmetical method of finding what number would result from adding several of the *same* numbers together. In other words, it is the process of forming a multiple: thus, to multiply 6 by 9, is to repeat 6 nine times, and to add all the results together. This is the first and fundamental meaning of multiplication. The numbers multiplied are called factors, and the result is called the *product*.

MU'LTIPLIER. An instrument invented simultaneously by Schweigger and Poggendorf, for indicating the deflecting influence of an electric current, and applied in cases in which the current is so weak as to require its conduction several times round the needle, thus repeating or *multiplying* the deflecting influence of the single current.

MU'LTIVALVE (*multas valvas* habens). Having many valves, as the chitons among testaceous mollusca.

MURÆ'NIDÆ (*muræna*, a lamprey). *Anguillidæ*. The eel tribe; the single family of *Malacopterygious* or soft-spined fishes, belonging to the section *Apodes*, in which the ventral fins are wanting.

MURAL CIRCLE. An instrument for measuring the distances of stars from the poles or the Zenith. It consists of a circle constructed of metal, and mechanically divided into equal parts, as degrees, minutes, &c. A tube is adjusted to the circle so as to revolve together with it on an axis concentric with the circle. The axis is let into a wall, and rendered capable of adjustment both in a vertical and horizontal direction; so that, like the axis of the transit, it can be maintained in the exact direction of the east and west points of the horizon, the plane of the circle being consequently truly meridional.

MU'RCHISONITE. A variety of moonstone or felspar, occurring in the new red sandstone, in the neighbourhood of Dawlish.

MURE'XIDE (*murex*, a molluscous animal yielding a purple dye). A beautiful purple product of the decomposition of uric acid, first described by Dr. Prout as purpurate of ammonia. *Murexan* is the purpuric acid of Prout.

MU'RIACITE. Anhydrous sulphate of lime, also called *anhydrite* and *cube-spar*, occurring crystalline, fibrous, granular, and compact. To the last of these belong some of the Italian varieties known by the names of *bardiglio* and *bardiglione*, as also the singular fibrous-compact variety familiarly called *tripe-stone* (pierre des trippes), from the salt mines of Wieliczka.

MURIATE or HYDROCHLORATE. A salt formed by the combination of muriatic or hydrochloric acid. Metallic muriates which contain an excess of acid are called *oxy-muriates;* those in which there is a deficiency of acid, are named *sub-muriates*.

MURIA'TIC ACID (*muria*, brine). *Hydrochloric acid.* An acid consisting of chlorine and hydrogen, and contained in great abundance in sea-water, in combination with soda and magnesia. *Oxygenated muriatic acid* is another name for chlorine.

MURICA'LCITE. Another name for *rhomb-spar*, a mineral consisting of the carbonates of lime and magnesia. It is also called *bitter-spar*.

MURI'CIDÆ. The Murexes and Whelks; a family of carnivorous Gasteropods, having the respiratory siphon in general very much developed, and its corresponding canal at the base of the shell always straight.

MURICI'NÆ. Murexes; a sub-family of the Muricidæ, named from the typical genus *murex*, and sometimes called *rock-shells*, from the roughness and irregularity of their surface.

MU'RIDÆ (*mus*, a mouse). The Rat tribe; a family of the *Rodentia*, containing the smallest and the most numerous species of the Mammalia.

MU'RIDE (*muria*, brine). The name first given to bromine, from its being an ingredient of sea-water.

MU'RIFORM (*murus*, a wall, *forma*, likeness). Wall-like; a term applied to the tissue constituting the medullary rays in plants, from its presenting an appearance similar to that of bricks in a wall.

MU'SCA. The Fly; a modern northern constellation, consisting of six stars, situated between Crux and the South Pole.

MU'SCHELKALK (*muschel*, a shell, *kalk*, lime). A limestone, belonging to the Upper New Red Sandstone group. Its position is between the Magnesian Limestone and the Lias. This formation has not yet been found in England, and the German name is adopted by English geologists.

MUSCI. The Moss tribe of Acotyledonous plants. Cellular, *flowerless* plants, with *leaves* imbricated, entire, or serrated; *reproductive organs* either *axillary bodies* containing spherical or oval particles, emitted on the application of water, or *thecæ*, seated on a seta or stalk.

MUSCICA'PIDÆ (*muscicapa*, the fly-catcher). *Myiotherinæ.* The Fly-catchers; a family of the *Insessores*, or Perching birds, characterized by the peculiar form of the bill, with the strong bristles at its base, and by the small size of the feet. See *Dentirostres*.

MUSCIDÆ (*musca*, a fly). The Fly tribe; a family of Dipterous insects, belonging to the sub-section Athericera, readily distinguished by their strong general resemblance one to another. Their larvæ are known as *maggots*.

MUSCOVY GLASS. Another name for *mica*, most of the commercial article being brought from Siberia, where it is used for window-glass.

MUSCULAR IMPRESSIONS. A term applied to those indented marks in acephalous bivalves, which indicate the insertion of those muscles by which the animal is attached to its shell. Of these there are three principal varieties:—

1. The *lateral* impressions, which denote that the animal has two adductor muscles, as in *unio cardium*, and all the most typical bivalves.

2. The *central* impression, which denotes the presence of only one adductor muscle, which is generally in the middle of the shell, as in the oyster.

3. The *pallial* impression, which occurs in all these shells, and is indicated by a depressed line, often sinuated, running parallel with the ventral margin.

MUSICAL SOUND. A succession of sounds which follow one another with such regularity as to produce the impression of a single sound.

MUSOPHA'GIDÆ. The Plantain-eaters; a family of birds intermediate between the Finches and the Hornbills, the *Musophaga* being the most conspicuous of the group.

MUSSEL BAND. The black shale of coal mines, containing embedded mussel-shells.

MUSSITE. A pale green mineral from Mussa, in Piedmont, consisting of a variety of augite.

MUSTE'LIDÆ (*mustela*, a weasel). The Weasel tribe; a family of carnivorous vertebrata, which are mostly semi-plantigrade, a portion of the sole touching the ground. These animals, owing to the length of their bodies, and the shortness of their limbs, are enabled to insinuate themselves into small orifices, and are hence called *vermiform*.

MYADÆ. Gaping Bivalves; a family of the macrotrachian bivalves; named from the genus *mya*, and having the valves more or less gaping at one or both extremities.

MYCE'LIA (μύκης, a mushroom). The rudiments of fungi, or the matter from which fungi are produced.

MYELENCE'PHALA (μυελὸς, marrow, ἐγκέφαλον, the brain). A term applied by Owen to the grand primary division *Vertebrata* of the animal kingdom, comprising animals which possess a brain and spinal marrow. These are the *Spinicerebrata* of Grant.

MYELONEU'RA (μυελὸς, marrow, νεῦρον, nerve). The name given by Rudolphi to a group of animals corresponding with the Articulata of Cuvier, which have a ganglionic nervous system, forming a cord considered analogous to the spinal marrow of the Vertebrata.

MY'IOTHE'RINÆ (μυῖα, a fly, θηράω, to chase). Fly-chasers; a family of the *Insessores* or Perching birds, or the *Excurtrices* of Macgillivray. The term is synonymous with Muscicapidæ.

MYRIA'PODA (μυρίος, innumerable, ποὺς, ποδὸς, a foot). The first class of the *Diplo-gangliata*, or Entomoïda, comprising animals with articulated bodies, all the segments of the trunk being provided each with one or two pairs of jointed ambulatory feet. They are divided into the two following orders by the differences of their jaws and feet:—

1. *Chilognatha*, or those which have solid cylindrical segments, antennæ with seven joints, two strong mandibles without palpi, and very short feet terminated by simple ungues, as in the *iulus*.

2. *Chilopoda*, or those in which the segments are more soft and depressed, and each furnished with a single pair of feet; the antennæ have more than thirteen joints, and the mouth is furnished with palpigerous mandibles, and with an upper and lower lip, as in the *scolopendra morsitans*.

MY'RICIN. The ingredient of wax which remains after digestion with alcohol.

MYRISTICA'CEÆ. The Nutmeg tribe of dicotyledonous plants. Trees with *leaves* alternate; *flowers* diœcious, with no trace of a second sex; *fruit* baccate, dehiscent, 2-valved; *seed* nut-like, enveloped in a many-parted *arillus*.

MY'RMELEO'NIDÆ (μύρμηξ, an ant, λέων, a lion). A family of *Neuropterous* insects, named from the typical genus *myrmeleon*, the larvæ of which, from their peculiar habits, have acquired the name of *ant-lions*.

MY'RMOTHERINÆ (μύρμηξ, an ant, θηράω, to chase). Myrmotherine birds, or Ant-catchers; a family of the *Cantatrices* of Macgillivray, distinguished from the Thrushes chiefly by their shortened form. The only British species is the Cinclus or Dipper.

MYRO'NIC ACID (μύρον, an odorous oil). A bitter acid procured from black mustard seeds.

MYRTACEÆ. The Myrtle tribe of dicotyledonous plants. Trees or shrubs with *leaves* opposite, entire, and marked with transparent dots; *flowers* polypetalous; *stamens* perigynous; *carpella* concrete; inferior *ovarium* with several cells.

MYSTACI'NEÆ (μύσταξ, moustache). A family of the Infusoria, including those which have superficial cilia disposed in groups.

MYTILA'CEÆ. The Mussel tribe; an order of the conchiferous Mollusca, named from the *mytilus*, in which the mantle remains open in front (at the end where the mouth is situated), and closed behind, an aperture being left for the egress of the fluid. They have a foot sufficiently strong for crawling, and commonly affix themselves by a byssus.

N

NA'CREOUS (*nacre*, pearl). A term applied to a shell which has a pearly lustre and reflects iridescent light.

NACRITE. The name given by Jameson to talcite, or the earthy talc of Werner; a very rare mineral, occurring in veins, with sparry ironstone and galena, in the mining district of Freyberg.

NADIR. An Arabic term denoting that point of the sphere of the heavens which is diametrically opposite to the zenith, and vertically beneath the feet of a spectator. The term evidently corresponds with the German *nieder* (down). The zenith and the nadir are the two poles of the horizon. See *Zenith*.

NADLESTEIN. Another name for rutile, an ore of titanium.

NAGYAG ORE. Foliated tellurium, a mineral consisting of tellurium and lead.

NAI'ADES. A family of fresh-water conchiferous mollusks, comprising the genera unio, hyria, anodon, and iridina, occurring abundantly in the North American rivers.

NAKED SEEDS. An incorrect term, applied by Linnæan botanists to the small seed-like fruits of the Labiatæ, Boraginaceæ, and other families of plants. Seeds entirely destitute of a pericarp occur only in Coniferæ, Cycadaceæ, and Gnetaceæ.

NAKER FELDSPAR. A species of feldspar, also called *adularia*, and found principally on Mount St. Gothard, but not in the valley of Adula, from which the latter name is derived. The fine variety from Ceylon, when cut *en carbochon*, is called moonstone; and a yellow naker feldspar with reddish dots has obtained the name of sunstone, which is also sometimes given to the beautiful avanturino variety of common feldspar.

NANCE'IC ACID. An acid found in many acescent vegetable substances, and named by Braconnot from the town of Nancy

NAPHTHA. A highly inflammable, thin, colourless oil, which issues from the white, yellow, or black clays in Persia and Media, and of which there are springs in many countries, particularly in volcanic districts. *Black Naphtha* is a common name for petroleum, or rock oil.

NAPHTHALINE. A greyish white substance found during the rectification of the petroleum of the coal gas works, incrusting the pipes. *Mineral* or *resinous Caphthaline* has been found native in a layer of lignite, in the coal formation of Uznach.

NAPIER'S RODS, or BONES. A contrivance for facilitating the mechanical performance of multiplication and division. The invention has been superseded by the discovery of logarithms.

NAPLES YELLOW. A pigment prepared by calcining lead with antimony and potash in a reverberatory furnace, formerly made at Naples.

NAPO'LEON. A name given to the constellation Orion.

NASCENT STATE (*nascor*, to be born). A term applied to the state of gases, *at the moment of their generation*, before they have acquired the repulsive power.

NASSI'NÆ. A sub-family of the *Muricidæ*, named from the typical genus *nassa*.

NATATO'RES (*nato*, to swim). An order of Birds, easily distinguished by their oar-like feet, adapted to swimming. They include the duck, the gull, the pelican, the diver, and the penguin. In the first three, the length of the wings adapts them for flight; in the last two, the wings are short, and serve only as fins.

NATI'CIDÆ. The Nerits; a family of the Phytophagous Gasteropods, in which the spire is very small, but the pillar is always thick; the exposed part, or inner lip, is often very broad; the animal is slug-shaped.

NATICI'NÆ. Sea-snails; a sub-family of the *Naticidæ*, named from the genus *natica*, and characterized by a globose shell; the inner lip is smooth, not depressed.

NA'TRIUM. A term formerly used to designate sodium. *Natron* is native carbonate of soda, found in mineral seams or crusts, and hence called *mineral alkali*.

NA'TROLITE. A sub-species of

prismatic zeolite or mesotype, occurring in chalk-stone porphyry in Wurtemberg and Bohemia, &c.

NATRON. Native carbonate of soda. There are two kinds, the common and the radiated. See *Natrium.*

NATURAL. A character in music, marked ♮, employed to make a sharp note a semitone lower, and a flat note a semitone higher; or, in other words, to restore to the scale of the natural key of C any note which had been made flat or sharp.

NATURAL ORDERS OF PLANTS. That arrangement of plants in which groups are formed by the association together of those genera, which have the greatest resemblance one to another in all their characters taken together. Nature has pointed out this plan in several well-marked groups, and it is the object of botanists to extend the principle to all the individuals of the vegetable kingdom.

NATURAL PHILOSOPHY. The science which teaches the nature and properties of matter, the motions of bodies, their connexions with, and their influence upon, one another. The subject is distinguished into the two branches of Mechanical Philosophy and Chemistry.

NAUCUM. An old Latin term applied by botanists to the exterior coat of the drupe; it is soft and fleshy, and separable from the interior, hard, and bony coat, which is called the *endocarpium*, or stone. Gærtner applied the term *nauca* to seeds which have a very large hilum, as that of the horse-chestnut.

NAUTICAL DISTANCE. In navigation, this term denotes the line which makes with the meridian lines the angle called the course. In other words, the rhumb line intercepted between any two places through which the rhumb line passes, is their nautical distance.

NAUTI'LIDÆ. The sixth family of Lamarck's polythalamous cephalopods, named from the genus nautilus. It forms the fifth family of the Polythalamaceæ of De Blainville.

NAU'TILITES. Fossil shells, analogous to the *nautilus*, found in various strata, from the oldest limestones and sandstones of the Silurian system, to those covering the chalk.

NAVIGATION (*navigo*, to manage a ship). The science which teaches the mariner how to conduct his ship from one port or place to any other. It consists in the practical application of a branch of mathematics, and of a branch of astronomy, which owes its name to this application.

NEACOMIAN SYSTEM. A geological formation comprising the *green sand* system, and divided into the *lower green sand—galt*, or Cambridge clay—and *upper green sand.* The last two are considered by some writers as a part of the Cretaceous system.

NEBULA (dim. of *nubes*, a cloud). A dusky speck in the heavens, exhibiting a dim and cloudy light, scarcely visible to the naked eye, and supposed to consist of a cluster of stars closely connected in the most beautiful arrangement, and at such an inconceivable distance from our system, that each of them is conjectured to be composed of several thousand distinct luminous bodies. Nebulæ have been distinguished by Sir W. Herschel into—

1. *Clusters of stars*, in which the stars are clearly distinguishable; and these, again, into globular and irregular clusters.

2. *Resolvible nebulæ*, or such as excite a suspicion that they consist of stars, and which any increase of the optical powers of the telescope may be expected to resolve into distinct stars.

3. *Nebulæ, properly so called*, in which there is no appearance whatever of stars; which, again, have been subdivided into subordinate classes, according to their brightness and size.

4. *Planetary nebulæ*, having, as their name imports, exactly the appearance of planets, and, whatever be their nature, of enormous magnitude.

5. *Stellar nebulæ*, of a round or oval figure, increasing more or less in density towards the central point: they differ extremely, however, in this respect, the condensation in some being slight and gradual, in others great and sudden, so as to represent a star with a slight burr round it.

6. *Nebulous stars*, presenting the appearance of sharp and brilliant stars surrounded by a perfectly circular disc, or atmosphere of faint light, in some cases dying away on all sides by insensible gradations; in others, almost suddenly terminated.

NECESSARY. "This word is used as the contrary to 'impossible' in all its senses, and is, of course, liable to a corresponding ambiguity. Thus, it is 'mathematically necessary' that two sides of a triangle should be greater than the third; there is a 'physical necessity' for the fall of a stone; and a 'moral necessity' that beings of a certain character should act, when left perfectly free, conformably to that character; *i. e.* we are sure they *will* act so; though, of course, it is in their power to act otherwise." The ambiguity consists in confounding the second and the third kinds of necessity, and thus finding an excuse for immoral conduct.—*Whately.*

NECESSARY MATTER. In Logic, the necessary matter of a proposition denotes the essential or invariable agreement of its terms. In necessary matter, all affirmatives are true, and negatives false; in impossible matter, *vice versâ;* in contingent matter, all universals are false, and particulars true.

NE'CROMITE. A white mineral found near Baltimore, in small masses, in limestone.

NE'CTARY. That part of a flower which secretes *nectar* or honey. The term has been vaguely applied to several parts which have no such function.

NEEDLE-ORE. A triple sulphuret of bismuth, lead, and copper, also called acicular bismuth glance.

NEEDLE-STONE. A zeolitic substance of a greyish-white colour, found in secondary trap rocks near Old Kilpatrick in Scotland.

NEGATION, CONVERSION BY. In logic, a mode of illative conversion, commonly called by *contra-position.* Thus it may be said—"Every poet is a man of genius; *therefore,* he who is not a man of genius is not a poet;" for it is the same thing to *affirm* some attribute of the subject, or to *deny* the *absence* of that attribute.

NEGATIVE QUANTITY. In algebra, any quantity to which the sign — is prefixed, is called a *negative* quantity. The explanation of such a quantity is a difficult matter. It is, however, usually defined, either as a quantity less than nothing, or as a quantity of the same nature as a positive quantity, but taken in a contrary sense or in an opposite direction. See *Quantity.*

NEGATIVE TERM. In logic, a negative term denotes that a certain view is not and *could* not be formed of a particular object, as a "dumb statue," a "lifeless carcass." Compare *Privative.*

NEMATOI'DEA (νῆμα, νήματος, a thread, εἶδος, likeness). Round worms; an order of the Entozoa, which have a long, cylindrical, and often filiform, naked, inarticulated body, traversed by a straight alimentary canal open at both ends. These are the *cavitary intestinal worms* of Cuvier, the *sterelmintha* of Owen.

NE'MATONEU'RA (νῆμα, νήματος, a thread, νεῦρον, a nerve). A term applied by Owen to a division of the *Radiata* of Cuvier, in which the nervous matter is distinctly aggregated into filaments, and in some cases nuclei of rudimentary nervous centres have been noticed.

NEMO'CERA (νῆμα, a thread, κέρας, a horn). A section of Dipterous insects, characterized by their long filiform antennæ, composed of more than six joints.

NE'PHELINE (νεφέλη, a cloud). *Sommite.* Rhomboidal feldspar, occurring at *Monte Somma,* near Naples, in granular limestone, and in the lava of Capo di Bove, near Rome. In nitric acid its transparent fragments become *cloudy.*

NEPHRITE (νεφρὸς, a kidney). *Jade.* A mineral occurring in gneiss and granite. It comprises the common variety and axestone. The South America variety is called Amazonian stone, from its locality. It was formerly used, as an amulet, in *nephritic* complaints.

NE'PIDÆ. A family of the *Hydrocorisa,* or Water Bugs, resembling the Notonectidæ, or boat-flies, in structure and in habits, but endowed with slower powers of motion.

NEPTU'NIAN THEORY. A geological theory of Werner, which refers the formation of rocks and strata to an aqueous origin.

NEREIDÆ. A common name for a highly organized order of *Annellida,* taken from the Linnæan generic name *Nereis,* which is almost equivalent to the ordinal designation *Errantes* of Milne Edwards. These are the *dorsibranchiata* of Cuvier, the sea-centipedes and sea-mice of popular language.

NERI'TINÆ. A sub-family of the *Naticidæ,* or Nerits, named from the genus *neritina;* in these shells the spire is often nearly or quite obsolete.

NE'RVURES (*nervus,* a sinew). The delicate frame-work of the membranous wings of insects.

NEURO'PTERA (νεῦρον, a nerve, πτερὸν, a wing). An order of insects furnished with four membranous wings, which are naked and reticulated with ramified tracheæ. It includes the dragon-flies, may-flies, ant-lions, white ants, &c.

NEUTRAL SALTS. Formerly, salts in which the base was perfectly saturated with the alkali, thus possessing neither an acid nor an alkaline character. The term now denotes those compounds, which are composed of one equivalent of each of their constituents, without reference to their taste, or to their action on coloured tests.

NEUTRALIZA'TION. A term generally applied to the decomposition of the alkaline carbonates, by the addition of some acid more powerful than the carbonic acid, which is consequently expelled from the alkaline bases with effervescence.

NEW RED SANDSTONE. A formation consisting chiefly of sandy and argillaceous strata, the predominant colour of which is brick-red, though it contains portions which are of a greenish-grey. The striped and spotted appearance of this series has caused it to be sometimes termed *variegated sandstone.* This formation has been divided into the Upper New Red, in which Muschelkalk is included, and the Lower New Red, of which the Magnesian Limestone is a member.

NICKEL. A metal of a colour intermediate between those of silver and of tin, and commonly obtained from its sulphuret, the *kupfernickel* of the Germans, which is generally mixed also with arsenic, iron, and cobalt. The sulphuret was formerly called capillary iron pyrites, and afterwards considered as native nickel, till its real composition was determined by Arfvedson.

NIDAME'NTAL (*nidus*, a nest). Relating to the protection of the egg and young, especially applied to the organs which secrete the materials of which many animals construct their nests.

NIDITE'LÆ (*nidus*, a nest, *tela*, a web). A family of Spiders, which weave a nest, from which issue threads to entrap their prey.

NIGRINE. An ore of titanium, consisting of this metal and iron.

NI'HIL ALBUM. A former name of the flowers or white oxide of zinc. *Lana philosophica* was an equally curious designation of the same substance.

NIMBUS, or CUMULO-CIRRO-STRATUS. The *rain-cloud;* a composite modification of clouds, resulting from increase of density and deepening of shade in the cumulo-stratus, indicating a change of structure, which is always followed by the fall of rain. All the other forms of cloud may increase so as to obscure the sky, and dissolve without falling in rain; but the nimbus, once formed, is always followed by rain or snow.

NINTH. A dissonant interval in Music, retarding the eighth and resolvible into either the sixth or the third. The major ninth consists of six tones and two semitones; the minor ninth, of five tones and three semitones.

NI'TRATES. Compounds of nitric acid with the salifiable bases.

NITRE. Saltpetre, or nitrate of potash. When fused, and poured into moulds, it is called *sal prunella*, or *crystal mineral;* when mixed with charcoal, and burnt, the residuum was formerly called *clyssus of nitre;* mixed with carbonate of potash and sulphur, in a warm mortar, it forms the *fulminating powder;* mixed with sulphur and charcoal, it forms *gunpowder;* and when mixed with sulphur and fine saw-dust, it constitutes the *powder of fusion.*

NITRIC ACID. A constituent of nitre or saltpetre, existing only in combination, and named, from its corrosive properties, *aqua fortis.*

NI'TROGEN (*νίτρον*, nitre, *γεννάω*, to produce; so called from its being a generator of nitre). *Azote.* An elementary principle, constituting four-fifths of the volume of atmospheric air. It was formerly called *mephitic air*, and, by Priestley, *phlogisticated air.*

1. *Nitrous Oxide.* Formerly called by Priestley, who discovered it, *dephlogisticated nitrous air;* but more properly, protoxide of nitrogen. Its common name is *laughing gas.*

2. *Nitric Oxide*, or nitrous gas. Formerly called *nitrous air;* but, more properly, deutoxide of nitrogen. When mixed with atmospheric air, *nitrous acid vapours* are produced, of a red or orange brown colour.

3. *Nitrous Acid.* Formerly called *fuming nitrous acid;* an acid of uncertain constitution, termed *hyponitrous* by Turner.

4. *Peroxide of Nitrogen.* A compound forming the principal part of the nitrous acid vapours above mentioned. This is the nitrous acid of Turner.

NITRUM FLAMMANS. Nitrate of ammonia, so named from its property of exploding, and undergoing total decomposition at the temperature of 600°.

NOBILI'S FIGURES. The name given to an electro-chemical phenomenon, discovered by Nobili. If a feeble current be applied to polished plates of platinum, steel, and silver, by using them as electrodes, and immersing them in an electrolytic fluid, certain figures will be visible, generally in the form of concentric circles whose centre is exactly opposite to the point of the wire, very much resembling Newton's Prismatic Rings, and so firmly fixed, that they cannot be removed even by washing the metal with nitric acid.

NOCTILIONI'NÆ. A family of insectivorous Cheiroptera, which are destitute of nasal appendages, and are almost exclusively confined to tropical countries.

NOCTU'RNA (*nocturnus*, nightly). A designation of the true moths, a tribe of *Lepidopterous* insects, the greater part of which fly by night.

NODAL LINES. A term employed in speaking of the undulations of solid bodies. Thus, in the movements of elastic planes, complete rows of points, called *nodal lines*, will be formed which do not participate in the movements of the planes, but are in a state of rest. These nodal lines are produced by the continuous succession of *nodal points*, in the strings of which the plane is supposed to consist. They run in various directions across the plane, dividing it into numerous vibrating portions, the contiguous portions invariably moving in contrary directions. The nodal lines form peculiar figures, called, after their discoverer, *Chladni's Sonorous Figures*.

NODAL POINTS. When a tense cord is thrown into vibration, it assumes throughout its entire length the form of elevations and depressions impinging on one another, the elevation passing into the form of a depression, and *vice versâ*. The point which bounds an elevation and a depression, continuing at rest during the vibration, is called a *nodal point*.

NODE (*nodus*, a knot). In astronomy, the *nodes* are the points where the orbit of a planet cuts the plane of the ecliptic. The node whence the planet rises towards the north above the plane of the ecliptic is the *ascending node*, that whence it descends towards the south is the *descending node;* the line joining the two is called the *line of the nodes.* Generally, the point in which one orbit cuts another is called the node of the first *upon* the second.

NODE (*in Botany*). This term signifies the thickened part of a stem or branch from which a leaf is developed. The space between two nodes is termed an *internode.*

NO'DULE (dim. of *nodus*, a node). A little node; a small woody body found in the bark of the beech and some other trees, and formed of concentric layers of wood arranged around a central nucleus. Dutrochet terms it an *embryo-bud.*

NODULE (in *Geology*). A rounded irregular-shaped lump or mass, varying in size, and embedded in a stratified or a massive rock.

NOMENCLATURE. A general designation of the terms employed in any science or art.

NOMINAL DEFINITION. In logic, a definition which explains only the meaning of the term defined, and nothing more of the nature of the thing signified by that term than is implied by the term itself to every one who understands the meaning of it. See *Real Definition.*

NOMINALISTS and REALISTS. Two scholastic sects of the 11th century, the former of which affirmed, according to the Platonic doctrine, that names or general terms have, apart from the mere conception of them by the understanding, an actual and eternal existence, and are the models of all created beings; while the latter maintained, according to the doctrine of Aristotle, that these names were eternally united to matter, and have no existence as unconnected with it. See *Idea.*

NO'MINATIVE CASE (*nomino*, to name). The *naming* case; the case which precedes the verb, and designates its subject absolutely, without relation to any other subject. A noun in the nominative case (*casus rectus*) was considered by ancient grammarians as a line perpendicular; and in the other cases (*casus obliqui*) as gradually *declining* or *falling* from the *perpendicular.* To decline a noun, is, therefore, to make it pass through these *cases* or *fallings*, and the representation of them is called a *declension.*

NON CAUSA PRO CAUSA. A logical fallacy in which the premiss (whether the expressed or the suppressed one) is either proved false, or has no sufficient claim to be received as true.

NON-CONDUCTORS. Substances which carry off free electricity slowly when touched by an electrified body; or, if their condition of electrical indifference is disturbed at any one point, they become electrical at that point only; and if their whole surface be excited, and they are then touched by some conductor connected with the ground, they part with their free electricity only at the point of contact. Their characteristic is, that *they retain free electricity for a length of time, and that they check its motion.*

NON-ELECTRICS. It was formerly thought that none but the non-conductors could be electrically excited, and that no other bodies possessed electricity; hence the name of *electrics* was given to the former, and that of *non-electrics* to the latter class of substances.

NONAGE'SIMAL DEGREE. The highest point of the ecliptic above the horizon. Every point, therefore, of the ecliptic is the nonagesimal degree in succession.

NO'NAGON (*novem*, nine, *γωνία*, an angle). In Geometry, a plane figure having nine angles and consequently nine sides. See *Enneagon*, which is a classical term, the other being barbarous.

NO'NIUS. A former designation of the *Vernier*, from its having been supposed that this instrument was merely an improvement of the method of subdivision adopted by *Nunnez*, a Portuguese. See *Vernier*.

NO'NTRONITE. Silicate of iron; a mineral occurring in small nodules in an ore of manganese, and found in the department of Dordogne in France, in the arrondissement of Nontron.

NOON, REAL and APPARENT. In Astronomy, the word *apparent* is used not as opposed to *real*, but as coinciding with it, and opposed to *mean*. Thus *apparent noon* means real or true noon, when the true sun, the sun which *appears*, is on the meridian, as opposed to *mean noon*, when the mean sun, the average fiction of astronomers, which does not *appear* at all, is on the meridian. See *Mean Noon*.

NOOTH'S APPARATUS. An apparatus invented by Nooth for making a solution of carbonic acid gas.

NORFOLK CRAG. A tertiary formation resting on London clay or chalk. It is included by a line drawn from Cromer to Wayburn, and thence southerly about eighteen miles towards Norwich.

NORMA. The Rule; a constellation situated between Scorpio and Lupus.

NORMAL (*norma*, a rule). From its original meaning of a *rule*, as used by builders, this term was used to signify a *perpendicular;* but it is generally employed to denote the perpendicular to a curve at some particular point, at which point the normal is also perpendicular to a tangent.

NORMAL GROUPS (*norma*, a rule or pattern). Groups of certain rocks taken as a rule or standard.

NORTH-WEST CURRENT. A branch of the great *Equatorial Current*, which separates from the equatorial at 22° w. long., takes a north-western direction, and is eventually lost in the drift current, to which it seems to give a north-westerly direction, which is observable from 35° w. long. to Trinidad.

NORTHERN LIGHTS. Luminous appearances in the horizon, less transient in their duration than the lightning, of frequent occurrence in the higher latitudes, more rare in the temperate zones, and scarcely ever seen within the tropics. In the northern hemisphere the illuminated part surrounds the north pole, in the opposite hemisphere the south pole; hence the respective names of *borealis* and *australis* applied to the aurora.

NOTACA'NTHA (*νῶτος*, the back, *ἄκανθα*, a spine). A section of Dipterous insects, in which the upper part of the thorax or scutellum is armed with spines.

NOTATION (*noto*, to mark). The act or practice of recording any thing by marks, as by figures or letters. 1. Mathematical notation comprises symbols of number; symbols of quantity, which are usually letters; and symbols of operation, as employed in algebra. 2. Notation in Music signifies the method whereby the pitch or tune, and the duration of musical sounds are represented, and by which definite periods of silence, called *rests*, are marked. It is to music, what letters and punctuation are to language.

NOTHOSAU'RUS (*νόθος*, spurious, *σαύρα*, a lizard). A spurious kind of saurian, found in the shelly limestone occurring in the middle of the sandy beds of the New Red Sandstone Formation.

NO'TIONAL and RELA'TIONAL. By these terms, Dr. Becker distinguishes all the words of language into two classes, *notional words* being those which express notions, or objects of the understanding, as verbs and nouns; while *relational words* are either mere terminations of notional words, expressing a relation between different objects, or separate words expressing relation, as prepositions. The former class of words belong to etymology, the latter to syntax.

NOTONECTIDÆ (*νῶτος*, the back, *νέω*, to swim). A family of the Hydrocorisa, or water-bugs, which swim on their backs, and, from their peculiar aspect, are commonly called boat-flies and water-boatmen.

NOUN (*nomen*, a name). A part of speech which denotes an object, or the qualities of an object. When it declares its own meaning, without the addition of another word, it is termed *substantive;* when it requires to be added (*adjici*) to a substantive, which stands under (*sub stat*) and supports it, and of which it shows the nature or quality, it is termed *adjective.*

NOVA'CULITE. Whet slate; a mineral substance found in beds in primitive and transition clay-slate.

NU'CLEATED (*nucleus*, a kernel). Having a nucleus or central particle; a term applied to the elementary cells of animal tissues, the most important properties of which reside in the nucleus.

NUCLEOBRANCHI'ATA. The name given by De Blainville to the fifth order of the second section of his second subclass (*Paracephalophora Monoica*). M. Rang makes them the first order of Cuvier's class *Gasteropoda*, and comprises under it some of the *Heteropoda* of Lamarck, and the family *Pterotrachées* of De Férussac.

NU'CLEUS (quasi *nuculeus*, dim. of *nux*, a nut). The kernel of a nut. The solid centre around which the particles of a crystal are aggregated. The pulpy conical mass which constitutes the central part of the ovule in plants. In Astronomy, the term nucleus denotes the apparently solid part or *body* of a comet, as seen through the hazy atmosphere which surrounds it.

NUCULA'NIUM. A superior, indehiscent, fleshy fruit, containing two or more cells, and several seeds, as the grape. By Desvaux it was called *bacca*, or berry, from which, however, it differs in being a superior fruit.

NU'CULE (*nucula*, dim. of *nux*, a nut). A little nut; a term applied by Desvaux to the fruit of the oak, the hazel, &c. It is more commonly called *glans*.

NUDIBRANCHIA'TA (*nudus*, naked, *branchiæ*, gills). An order of aquatic *Gasteropods*, which breathe by branchiæ unprotected by an external or internal shell. These comprise a part of the naked Gasteropods of Cuvier. They have no shell.

NULLI'PORA. A family of lithophytous polyps, the axis of which presents no visible pores on its surface. Some naturalists consider that these mucoso-calcareous bodies are not of animal origin. Of the latter opinion is De Blainville, who is opposed in this matter to Lamarck.

NUMBER. The abstract idea of number is that of *times* or *repetitions.* Newton defines number as the abstract ratio of one quantity to another quantity of the same species; and hence there are three kinds of numbers—integers, fractions, and surds.

1. *Number, Abstract and Concrete.* When numbers are used with reference to the things numbered, they are said to be *concrete* numbers. When used without such reference, merely to indicate a certain number of units of the same kind, they are called *abstract* numbers. Thus 500 is an abstract, 500 pounds a concrete number. An abstract number is a number of *times;* a concrete, a number of *things.*

2. *Number, Perfect and Imperfect.* 1. A perfect number is that which is equal to the sum of all its divisors; in other words, it is a number whose aliquot parts, added together, make a sum equal to the number itself. Thus, 6 is a perfect number, for its divisors or aliquot parts are 1, 2, and 3, and the sum of these is 6. So 28 is a perfect number, its divisors being 1, 2, 4, 7, 14, the sum of which is 28. 2. An imperfect number is one, of which the divisors or aliquot parts are not equal to the number itself. Thus, 12 is an imperfect number; for the sum of its divisors, 1, 2, 3, 4, 6, is 16.

3. *Number, Cardinal and Ordinal.* Cardinal numbers denote number, as *one, two, three,* &c.; ordinal numbers denote the place or number in succession, as *first, second, third,* &c. This distinction leads to a deceptive mode of speaking. "The real distinction is that of numeral *nouns* and numeral *pronouns,* to the latter of which the term 'ordinal' might properly be applied. That 'first, second, third,' &c., are properly pronouns is obvious, if we consider that, so far as they go, *this, that,* and *the other,* would supply their places. The so-called cardinal numbers denote collections; the ordinal numbers point out only the places of the several units of which a collection is composed. Even *one,* when its force

is simply selective or distinctive, is a pronoun, as in 'one or another'" (*Pen. Cycl.*). If it be asked, in what century the birth of a person occurs, who is born in the year 1800, the answer is,—if born in the year eighteen hundred (cardinal), the birth occurs in the nineteenth century; if in the eighteen hundredth year (ordinal), in the eighteenth.

4. *Numbers, Natural.* The general name for the whole scale of numbers, 1, 2, 3, &c. It is subdivided into the scale of *odd* numbers, 1, 3, 5, &c., and *even* numbers, 2, 4, 6, &c. These, again, are subdivided into *oddly odd* numbers, 3, 7, 11, &c.; *evenly odd* numbers, 1, 5, 9, &c.; *oddly even* numbers, 2, 6, 10, &c.; and *evenly even* numbers, 4, 8, 12, &c.

5. *Number, Square, Cube,* &c. When any number is multiplied by itself any number of times, the result is called a *power* of that number. The second and third powers are usually called the *square* and the *cube*, which are incorrect names, derived from certain connexions of these powers with the square and the cube in geometry. The division of numbers into *square* numbers, 1, 4, 9, 16, &c.; *cube* numbers, 1, 8, 27, 64, &c.; *fourth powers*, 1, 16, 81, 256, &c., and so on, may be carried to any extent.

6. *Number, Prime and Composite.* A prime number is one which is not divisible by any number except unity and itself, as 1, 2, 3, 5, 7, 11, 13, &c. A composite number is any number which is not prime.

7. *Number, Abundant, Perfect, Defective.* An abundant number is one, of which the sum of all its divisors exceeds itself: thus, 12 is an abundant number, for $1+2+3+4+6=16$. A perfect number is one, of which the sum of all its divisors is equal to itself: thus, 6 is a perfect number, for $1+2+3=6$. A defective number is one, of which the sum of its divisors is less than itself: thus, 10 is a defective number, for $1+2+5=8$.

8. *Numbers, Figurate.* A figurate number is any one out of any of the following series, the first excepted, which is only introduced as a basis:—

	1	2	3	4	5	6	&c.
I.	1	3	6	10	15	21	&c.
II.	1	4	10	20	35	56	&c.
III.	1	5	15	35	70	126	&c.
IV.	1	6	21	56	126	252	&c.
V.	1	7	28	84	210	462	&c.
&c.			&c.				&c.

Each number is the sum of the numbers in the preceding row: thus 10 is the sum of 1, 3, 6; 70 is the sum of 1, 4, 10, 20, 35; and 70 is the fifth number of the third order of figurate numbers.

9. *Numbers, polygonal and pyramidal.* The principle of these numbers is sufficiently explained under the article *Figurate Numbers* (p. 136). The following are some of the *polygonal* numbers:—

Triangular	1	3	6	10	15	21, &c.
Quadrangular	1	4	9	16	25	36, &c.
Pentagonal	1	5	12	22	35	51, &c.
Hexagonal	1	6	15	28	45	66, &c.

Pyramidal numbers are formed by summing the polygonal numbers; thus, to find pentagonally pyramidal numbers, take the pentagonal numbers:

1 5 12 22 35 51, &c.
1 6 18 40 75 125, &c.

10. *Numbers, Amicable.* These are numbers, each of which is equal to the sum of all the divisors of the other. Such are

284 and 220
17,296 and 18,416
9,363,583 and 9,437,056.

NUMBER of DIRECTION. A number not exceeding thirty-five, which number is the limit of Easter-day, this day always falling between the 21st of March and the 25th of April.

NUMBERS for STARS. A mode of denoting the stars adopted by Flamsteed, who numbered them, not in order of brilliancy, but in that of coming on the meridian. Thus, 1 Orionis, 1 of Orion, means the first which comes on the meridian, of all the stars in Orion which Flamsteed observed and recorded; 7 Leonis, 7 of Leo, is the star of this constellation which comes seventh on the meridian. So long as a star has either Bayer's letter (See *Letters for Stars*) or Flamsteed's number, both are used indifferently and perfectly understood; nor is it expected that there will be any connexion between the letter, which refers, or was supposed to refer, to the brightness of the star, and the number, which is derived from its position. Thus 1 Virginis happens to have ω for its letter; it is only of the sixth magnitude, though it comes early to the meridian; but α Virginis, a splendid star, is 67 Virginis in Flamsteed.

NUMERA'TION (*numerus*, a number). A method of calculating numbers by means of ten signs, viz a cipher and nine digits. Higher numbers are signified by placing these signs by the side of one another, and agreeing that the first figure on the right hand shall retain the value which it has when it stands alone; that the second on the right hand shall mean ten times as many as it does when it stands alone; that the third shall mean one hundred times as many as when it stands alone; the fourth, one thousand times; and so on.

NUMERATOR. In arithmetic, that part of a fraction which denotes how many of the aliquot parts of an integer or unit are taken, the nature of these parts being expressed by the *denominator*. Thus $\frac{5}{6}$ denotes five, not of units, but of sixths of a unit; six is the denominator, 5 the numerator or numberer of the parts taken.

NUMERICAL. In Algebra, this term is applied to co-efficients which consist of *numbers*, as distinguished from *literal* co-efficients, which consist of *letters*. As opposed to algebraical, it is applied to the magnitude of a quantity, considered irrespectively of its symbol; thus —20 is *numerically* greater than —10, though *algebraically* less.

NU'MMULITES (*nummus*, money, λίθος, a stone). An extinct genus of the order of molluscous animals, called Cephalopods, of a thin lenticular shape, resembling a coin, internally divided into small chambers.

NUT. A dry, bony, indehiscent, one-celled fruit, proceeding from a pistil of three cells, and enclosed in a cupule, as in the hazel, the acorn, &c. The term is sometimes applied to the fruit of borago, lithospermum, &c., but these fruits are more properly called *akenia*. The term *nux baccata* is sometimes applied to the fruit of taxus, &c.

NUTA'TION (*nuto*, to nod). The term applied to a small and slow gyratory movement of the earth's axis, by which, if subsisting alone, the pole would describe among the stars, in a period of nineteen years, a minute ellipse, having its longer axis equal to 18″·5, and its shorter to 13″·74; the longer being directed towards the pole of the ecliptic, the shorter at right angles to it.

NU'TTALITE. A mineral associated with calc-spar, from Bolton in Massachusetts. It appears to be an alumino-silicate of lime, potash, and iron.

NYCTERIBI'IDÆ. The Bat-lice; a family of dipterous pupiparous insects, parasitic on bats, and approaching to the spiders in form.

NYMPH. A fanciful term for the chrysalis or pupa state of insect life, applied to the active pupæ of orthopterous and hemipterous insects.

NYSSO'NIDÆ. A family of hymenopterous insects belonging to the section Fossores, named from the genus *Nysson*, and characterized principally by the absence of a notch on the inner side of the mandibles.

O

OB-. A Latin preposition, in composition signifying *inversion:* thus *ob*-ovate means inversely ovate; *ob*-conical, inversely conical. It is obvious that this term can only be employed in words which denote that one end of a body is wider than the other. Hence, it is superfluous in such a word as *ob*-lanceolate.

OBJECTIONS, FALLACY OF. A fallacious mode of argument, by which it is shown that *there are* objections against some plan, theory, or system, and thence it is inferred that it should be rejected; whereas that which *ought* to have been proved is, that there are *more* or *stronger* objections against the receiving than the rejecting of it.

OBLATE. A term signifying the reverse of oblong, or shorter in one direction than in another, and applied to a *spheroid* which is made by the revolution of an ellipse about the smaller of the two axes. Thus the earth is an *oblate spheroid*, the actual difference between the polar and the equatorial diameters being in the proportion of 300 to 301.

OBLIQUE. A term generally employed in opposition to direct or right. In astronomical language, the term *obliquity* denotes the angle made by the ecliptic with the equator. The greatest latitude at which the sun ever appears vertical is the obliquity of the ecliptic (See *Ascension*). In stereographic projection, an *oblique circle* is any circle oblique to the line of projection. *Oblique planes*, in dialling, are planes which recline from the zenith. *Oblique projection*, in mechanics, is the projection of a body at an oblique angle with the horizontal line. *Oblique sailing*, in navigation, is that which includes the calculation of oblique-angled triangles. *Oblique sphere*, in geography, is that in which the axis of the earth is inclined to the horizon of the place.

OBLONG (*oblongus*, of a figure inclining to long). A four-sided figure, which, like the square, has all its angles right angles, but, unlike the square, has not all its sides equal. The term *rectangle* is often used for it, but is obviously objectionable. An *oblong spheroid*, also called the *prolate* spheroid, is generated by the revolution of an ellipse about its longer axis, and is therefore elongated at the poles.

OBSI'DIAN. A volcanic product, or species of lava, very like common green bottle-glass, which is almost black in large masses, but semi-transparent in thin masses. Pumice-stone is obsidian in a frothy state, produced, most probably, by water which had been contained in, or had access to, the melted stone, and converted into steam. Solid obsidian often occurs in masses, which are partially converted into pumice. The name is derived from that of Obsidius, who first found it in Ethiopia.

OBSOLETE (*obsoletus*, grown out of use). A term denoting a faint indication of a character. Thus, the calyx of *Conium* is represented by an obsolete margin; slight and indistinct striæ upon a shell are termed obsolete striæ. In these cases, however, the obsolete state is not the result of accident, but of partial development.

OBTUSE. Blunt or dull; opposed to acute, as applied to an angle which is greater than one right angle and less than two; in other words, an angle which measures more than 90 and less than 180 degrees.

O'BVOLUTE (*obvolutus*, rolled over). A form of æstivation or vernation, in which the margins of one leaf alternately overlap those of the leaf which is opposite to it.

OCCULT SCIENCES. Hidden sciences; imaginary sciences, as alchemy, astrology, magic, &c.

OCCULTA'TION (*occulto*, to hide). In astronomy, the eclipsing of a fixed star by the interposition of the moon.

OCEAN. The one continuous fluid which spreads over nearly seven-tenths of the globe, all the gulfs and inland seas being branches of this universal ocean. Different names have, however, been given to various parts of it:—

I. SOUTH-EASTERN BASIN.

1. *Antarctic Ocean.* Comprised within the Antarctic circle; that is, between the parallel of 66° 32′ of southern latitude and the South Pole.

2. *Southern Ocean.* Bounded on the one side by the Antarctic circle, and on the other by a line drawn from Cape Horn to the Cape of Good Hope, thence to Van Diemen's Land, and again by the south of New Zealand to Cape Horn.

3. *Indian Ocean.* Lying between Africa on the west, and the peninsula of Malaya with the islands of Sumatra, Java, &c., and New Holland, on the east, and bounded by Persia and Hindostan on the north. The Red Sea or Arabian Gulf, the Persian Gulf, and the Bay of Bengal, are all parts of this ocean.

4. *Pacific Ocean.* Divided by the equator into *North* and *South*, and inclosed between America on the east, and New Holland, the islands of Java and Sumatra, and the continent of Asia, on the west. On the north it terminates at Behring's Straits. The seas of China, Japan, Okhotsk, &c., form parts of this ocean.

II. WESTERN BASIN.

1. *Atlantic Ocean.* Commencing in the south from a line drawn from Cape Horn to the Cape of Good Hope, and terminated on the north by the Arctic circle. It is divided into the *North* and *South* by the equator, and its branches are the Mediterranean, the North Sea or German Ocean, the Baltic, Baffin's Bay, Hudson's Bay, the Gulf of Mexico, and the Caribbean Sea.

2. *Arctic Ocean.* Surrounding the North Pole, and bounded by the Arctic circle and the northern shores of the two continents. The White Sea, the Sea of Kara, and the Gulf of Obe, are parts of it.

O'CHRE. Hydrated sesquioxide of iron; an argillaceous earth, impregnated with iron of a *red* or *yellow* colour.

O'CHREA. Literally, a boot; and hence applied, in botany, to the membranous tube which sheaths the stem of rhubarb and other plants, and consists of two stipules, cohering by their margins.

O'CTAGON (ὀκτὼ, eight, γωνία, an angle). A plane geometrical figure, contained by eight sides, and consequently having eight angles. When the sides and angles are equal, the figure is a *regular* octagon.

OCTAHE'DRITE (ὀκτὼ, eight, ἕδρα, a seat). *Anatase.* Pyramidal titanium ore, from Bourg d'Oisans, whence it is also called *Oisanite*.

OCTAHE'DRON (ὀκτὼ, eight, ἕδρα, a seat). In Geometry, a solid figure contained by eight equal and equilateral triangles.

OCTANDRIA (ὀκτὼ, eight, ἀνὴρ, a male). The eighth *class* of plants in the Linnæan system, characterized by their flowers having eight stamens.

Octo-gynia (γυνὴ, a female). The name given by Linnæus to those *orders* of plants which have eight pistils in their flowers.

O'CTANS HADLEIE'NSIS. Hadley's Octant; a modern southern constellation, consisting of forty-three stars.

OCTANT. A term applied to an intermediate point between a quadrature and a syzygy of the moon. See *Phases*.

O'CTAVE (*octavus*, the eighth). In Music, the simplest and most consonant interval, in which the higher note makes twice as many vibrations as the *fundamental note* from which it is derived; its ratio is, therefore, that of 1 : 2 :: 4 : 8, &c. This relation serves as the principal unit of measurement in music, its entire range embracing at most nine entire octaves, rising from the deepest note, which makes 32 vibrations in a second, to the highest, which performs 16,384 vibrations in the same time.

OCTO'PODA (ὀκτὼ, eight, ποὺς, ποδὸς, a foot). A designation of animals which have eight feet. The name of those Cephalopods which have eight prehensile organs attached to the head.

OCYPO'DIANS (ὠκὺς, swift, ποὺς, a foot). A tribe of brachyurous crustaceans, placed by Milne Edwards between the Pinnotherians and the Gonoplacians, and named from the genus *Ocypoda*. The family are characterized by their rapidity in running.

O'DERIT. An opaque black substance, occurring in Sweden: it is probably black mica; for it is capable of being split, like mica, into thin leaves.

ŒNANTHIC ETHER (οἶνος, wine, ἄνθος, flower). An oily liquid, which gives the characteristic odour to all wines.

Œnanthic acid. An acid found in the foregoing compound, in combination with ether.

Œ'STRIDÆ (*œstrus*, a gad-fly). The Bot-flies; a family of Dipterous insects, belonging to the section Athericera, remarkable for the peculiar habitation of the larvæ, and for the absence of any proper mouth in the imago state.

OFFICI'NA SCULPTORIA. A modern southern constellation, consisting of twelve stars.

OFFING. If we sail out of sight of land, whether we stand on the deck of the ship, or climb the mast, we see the surface of the sea—not losing itself in distance and mist, but terminated by a sharp, clear, well-defined line, or *offing*, as it is called, which runs all round us in a circle, having our station for its centre.

O'FFSET. *Propagulum.* A short branch of certain herbaceous plants, which is terminated by a tuft of leaves, and is capable of taking root when separated from the parent plant, as in houseleek. It differs little from the *runner*.

O'GAM or OGMA. An occult form of writing among the Irish, apparently of great antiquity. The term is a primitive Celtic word, signifying the *secrets of letters*.

OGY'GIAN DELUGE. A great inundation mentioned in fabulous history, as having taken place in the time of Ogyges, king of Attica, whose death is fixed in Blair's chronological tables in the year B.C. 1764.

OHM'S LAW. An important law which refers to all the causes which tend to impede the action of the voltaic battery. It is, that "the intensity of an electric current, when a battery is in action, is directly as the whole electromotive force in operation, and inversely as the sum of all the impediments to conduction." It may, therefore, be expressed by a fraction, whose numerator is the electromotive force, and its denominator the sum of the resistance of all its parts.

OI'SANITE. An ore of titanium, from the department of Oise.

OLD RED SANDSTONE. A formation lying immediately below the Carboniferous group. The term Devonian has been recently proposed for strata of this age, because in Devonshire they are largely developed, and contain many organic remains.

OLEA'CEÆ. The Olive tribe of dicotyledonous plants. Trees or shrubs with *leaves* opposite; *flowers* regular, monopetalous, hermaphrodite, or diœcious; *stamens* two; *ovarium* simple, superior, 2-celled; *seeds* pendulous.

OLEFIANT GAS (*oleum*, oil, *fio*, to become). A compound gas consisting of carbon vapour and hydrogen, and now viewed as a compound of the organic radical acetyl with hydrogen. Its name was derived from its forming an *oily* substance with chlorine.

OLEIC ACID (*oleum*, oil). An acid forming the essential part of fat oils which are not drying, *as* oil of almonds.

OLEO-RESINS. Native compounds of volatile oil and resin, the proper juices of coniferous and other plants.

O'LIGIST IRON. A subspecies of rhomboidal iron ore, comprising the common specular, and the micaceous specular varieties.

OLIGO- (ὀλίγος, little, few). A term used in Greek compounds, to denote that the number of any thing is small, not indefinite. It is contrasted by the prefix *poly-* (πολὺς, many), signifying that the number is large and not definite. Thus we have *oligo*-spermous and *poly*-spermous fruits.

OLIVE MALACHITE. Octahedral phosphate of copper, from Lebethen in Hungary.

OLIVE ORE. *Olivenite.* One of the arseniates of copper.

OLIVILE (*olea*, the olive). The name given by Pelletier to a peculiar substance which remains after gently evaporating the alcoholic solution of the gum which exudes from the olive tree.

OLI'VINÆ. An aberrant sub-family of the *Volutidæ*, or volutes, named from the typical genus *oliva;* these shells are cylindrical in shape; the aperture is linear, and the pillar thickened and confusedly plaited.

O'LIVINE (*olea*, the olive). An olive-coloured silicate of lime and magnesia. In its purer state it is denominated *chrysolite* or *peridot;* and when protoxide of iron is predominant, it has by some been called *hyalosiderite.*

OMNI'VOROUS (*omnis*, all, *voro*, to devour). A term applied to animals which feed on *all* substances indifferently. The term is synonymous with the Greek *pantophagous.*

O'MPHACITE. A variety of augite, of a pale green colour, occurring in primitive rocks, with precious garnet, in Carinthia.

OMPHALO'DIUM (ὀμφαλὸς, the umbilicus). A term applied by Turpin to the centre of the hilum of the seeds of plants, through which the nutrient vessels pass to the embryo.

ONUS PROBANDI. The *burden of proof*, in Rhetoric, rests with him who would deny any generally received opinion, as that of gravitation, that of the Copernican theory, &c.

O'NYX (ὄνυξ, *onyx*, a nail). A variety of agate, in which the siliceous particles are disposed in alternating horizontal layers of opaque white, and translucent blue, grey, or brown, resembling the marks on the human *nail.*

O'OLITE (ᾠὸν, an egg, λίθος, a stone). A limestone; so named from its being composed of rounded particles, like the roe or eggs of a fish. The term is also applied to a large group of strata, characterized by peculiar fossils, in which limestone of this texture occurs.

1. *Lower Oolite.* A series of strata of oolitic limestone, clays, and marls, reposing above the lias, and divisible into the Lower or Cheltenham Oolite, Fuller's Earth, Stonesfield Slate, Great Oolite, Forest Marble, and Corn-brash.

2. *Middle Oolite.* A series of strata, consisting of coralline and shelly oolitic limestone, calcareous sandstone, and clays, separated from the Lower Oolite by a great deposit of clay, and divisible into Oxford Clay, Calcareous Grit or Sandstone, Coral Rag and Oolite, and Calcareous Sandstone.

3. *Upper Oolite.* A series of strata separated from the Middle Oolite by a great deposit of clay, and divisible into the Kimmeridge Clay, Portland Sand, and Portland Oolite.

OOZO'A (ᾠὸν, an egg, ζῶον, an animal). A designation given by Carus to one of the primary divisions of the Animal Kingdom, from the resemblance of the beings composing it to the eggs or rudiments of more perfect forms. They correspond with the *Acrita* of Macleay, the Cryptoneura of Rudolphi, and the Protozoa of other writers.

OPA'CITY (*opacus*, dark). A quality of bodies which renders them impervious to the rays of light. In this respect *opaque* bodies are the reverse of the *transparent;* but their opacity is occasioned rather by their thickness than their absolute impermeability to light. Gold is considered opaque; but the rays of a candle, or of the sun, falling on a sheet of gold leaf laid on glass, are transmitted as a faint green glimmering light.

OPAL. Opaline substances are mostly hydrates of silica, and are named—

1. *Precious* or *Noble Opal*, which owes its beautiful play of colours to a multiplicity of imperceptible fissures in its interior. A variety of this kind has the property of becoming transparent when

immersed in water, and is called hydrophane, oculus mundi, or changeable opal.

2. *Sun* or *Fire Opal*, of a hyacinth-red colour, changing to a paler hue by heat; found only at Zimapan in Mexico, in a particular variety of hornstone porphyry.

3. *Common Opal*, a translucent white variety of which, appearing yellow or red when held between the eye and the light, is called girasol.

4. *Semi-opal*, agreeing in its principal characters with common opal, and presenting spotted, striped, or brown delineations.

5. *Mother-of-pearl Opal*, or Cacholong, described as a variety of quartz, found in the river Cach in Bucharia.

6. *Jasper Opal*, or ferruginous opal, of a scarlet-red and grey colour, referred by some authors to jasper.

7. *Wood Opal*, or opalized wood, consisting of wood petrified by silicious earth, and acquiring a structure similar to simple mineral opal.

8. *Liver Opal*, or menilite, found at Menil-Montant, near Paris, in a bed of adhesive slate.

OPE'RCULUM (*operio*, to shut up). A cover or lid. In Malacology, the term *operculum* denotes the hard lid, either corneous or calcareous, which closes the mouth of many spiral shells, and is carried on the posterior part of the belly of the animal.

OPHI'DIA (ὄφις, a serpent). An order of Reptiles, comprising the Serpents, which have no atlantal or sacral extremities perceptible externally, and consequently no members or appendages of locomotion.

OPPOSITE TERMS. In logic, those terms are said to be *opposite*, or inconsistent, which express qualities inapplicable to the same object at the same time, as "black and white." Relative terms are opposite, only when applied with reference to the same subject: as one may be both Master and Servant; but not at the same time to the same person.

OPPOSITION. Two bodies are in *conjunction*, when they are at the same point of a circle; and in *opposition*, when they are at opposite points. For the application of these terms in Astronomy, see *Conjunction and Opposition.*

OPPOSITION, LOGICAL. Two propositions are said to be *opposed* to each other, when, having the same subject and predicate, they differ, in *quantity*, or *quality*, or *both*. The four kinds of opposition are termed contraries, subcontraries, subalterns, and contradictories.

O'PTICS (ὄπτομαι, to see). That branch of natural science which treats of the properties of *light* and *vision*; in its proper acceptation, it relates to *direct* vision, while catoptrics treats of *reflected*, and dioptrics of *refracted* vision. *Practical Optics* is the application of the physical properties of light, and the mathematical laws of optics to the construction of optical instruments.

O'RBIT (*orbita*, a track). The course which a star describes around the sun or another star. The Latin word *orbis* is a circle, or a globe; and hence the paths of the planets round the sun are termed *orbits*, and the planets themselves *orbs*, although the former are now understood to be elliptical, and the latter spheroidal. The earth's orbit is the ecliptic.

1. *Orbit, Plane of.* The plane of an orbit is an imaginary surface, passing from one extremity, or side of the orbit to the other. If the rim of a drum-head be considered the orbit, its plane would be the parchment extended across it, on which the drum is beaten.

2. *Orbits, inclination of.* If we suppose planes to pass through the orbits of the planets, and to be indefinitely extended, all these planes will pass through the sun's centre; but all of them will cut the plane of the ecliptic, though at different angles, which are respectively called the *inclination of the orbits.* The average inclination of the moon's orbit is about five degrees.

ORBITE'LÆ (*orbis*, an orb, *tela*, a web). A family of Spiders, which spread abroad webs of a regular and open texture, either circular or spiral, and remain in the middle, or on one side, in readiness to spring upon an entangled insect.

ORCEIN. A red colouring matter found in archil, and referred by Dr. Kane to a mixture of two substances, which he terms *alpha-orcein* and *beta-orcein*, the latter being produced by oxidation of the former.

ORCHIDA'CEÆ. The Orchis tribe of Monocotyledonous plants, in which the stamens and the style are consolidated into a central column, and the ovary is inferior. They correspond with the *Gynandria Monandria* of Linnæus.

ORCIN. A colourless matter procured from the lichen *dealbatus*, assuming a deep violet colour when exposed to ammonia and air, owing to the formation of *orcein*.

O'RDINATE (*ordino*, to arrange). A term applied, in Conic Sections, to one half of any line drawn across an ellipse, parallel to the minor axis. The whole line is called a *double ordinate*, and the portion of the major axis which it cuts off is called an *abscissa*. These terms are equally and similarly applicable to the parabola and the hyperbola.

ORES. The mineral bodies from which metals are extracted. These are termed *sulphurets*, when combined with sulphur; *oxides*, when combined with oxygen; and *salts*, when combined with acids.

ORGA'NIC REMAINS (*ὄργανον*, an organ). The remains of *organized* bodies, both plants and animals, found in a fossil state.

ORGANO'GRAPHY (*ὄργανον*, an organ, *γράφω*, to describe). By this term De Candolle designated his learned work on the structure of plants; and although the word simply means a "description of organs," it has been restricted to the organs of plants, comprising an account of their elementary tissues, and of their compound structures.

O'RGANON (*ὄργανον*, an instrument or machine). A philosophical term, denoting a *method*, and usually applied to a body of rules and laws for conducting a scientific inquiry. What is called the *Organon* of Aristotle, is a collection of the views of that philosopher on the several subjects of the Categories, including his Logic; of the Interpretation or the Nature of Propositions; of the former and latter Analytics; of Topics; and of Sophisms. The term *organon* was not given by Aristotle, but is of a date posterior to him.

Novum Organon Scientiarum. The name given by Bacon to his learned work on "A New Method of studying the Sciences." This method, which is founded on the principle of *Induction*, or actual experiment, which Bacon significantly terms "Asking Questions of Nature," has earned for its author the appellations of the Prophet of the Arts and the Father of Experimental Philosophy. See *Baconian Philosophy*.

ORIOLI'NÆ (*oriolus*, the oriole). Orioline birds, or Orioles; a family of the *Cantatrices* of Macgillivray, belonging to the warmer regions of the Old Continent. They appear to be allied to the Rollers, not only in the form of the bill, but also in their short tarsi and broad toes.

ORI'ON. A southern constellation, consisting of seventy-eight stars, the principal of which is Betelgeuse.

ORNITHO'LOGY (*ὄρνις*, a bird, *λόγος*, an account). The science which teaches the natural history and arrangement of birds. See *Zoology*.

O'RPIMENT (*auri pigmentum*). A general name for two sulphurets of arsenic, the *yellow*, or prismatoidal sulphur, and the *red*, ruby sulphur, or hemi-prismatic sulphur. The former is the colouring principle of the paint called *King's yellow*.

O'RRERY. A machine for representing the motions, relative magnitudes, and distances of the bodies composing the solar system; said to have been named after an earl of Orrery, for whom the first machine of the kind was made by Prince Eugene. Planetary machines have received various names, sufficiently indicative of their object, viz., planetarium, tellurian, lunarian, and satellite machine.

ORSEDEW. Manheim or Dutch Gold; an inferior sort of gold leaf, prepared of copper and zinc, sometimes called *leaf brass*, and principally manufactured at Manheim.

O'RTHITE (*ὀρθὸς*, upright). A silicate containing yttria and protoxide of cerium, and named from its always occurring in straight layers, generally in felspar.

ORTHOCERA'TA (*ὀρθὸς*, straight, *κέρας*, a horn). An extinct genus of Cephalopods, which inhabited a long-chambered conical shell, like a *straight horn*.

ORTHOGO'NAL (*ὀρθὸς*, right, *γωνία*, an angle). In Geometry, this term simply means *at right angles*, or perpendicular· thus, a curve cuts a set of curves orthogonally, when it cuts them all at right angles. The term is sometimes used synonymously with *orthographic*, and relates to a particular mode of projection. See *Projection*.

ORTHO'GRAPHY (*ὀρθὸς*, right, *γράφω*, to write). In its general sense, this term denotes that part of Grammar which teaches the nature and powers of letters, and the correct method of spelling and writing words. The sense of the word has, however, been restricted by grammarians to the proper selection of the letters of words, and the correct division of words when separated by the termination of lines.

ORTHO'PTERA (*ὀρθὸς*, straight, *πτερὸν*, a wing). An order of insects, comprising the locusts, grasshoppers, crickets, &c.; having their anterior wings coriaceous and overlapping each other; the posterior partly coriaceous, partly membranous, and folded longitudinally when at rest.

O'RTIVE AMPLITUDE (*ortus*, a rising). An astronomical term, denoting the arc of the horizon intercepted between the point where a star rises and the east point. Hence it is also called *eastern amplitude.*

ORY'CTOGNO'SY (ὀρυκτὸς, dug up, γνῶσις, knowledge). *Oryctology.* That branch of science which relates to fossil organic remains. The term is sometimes applied to that branch of mineralogy which relates to the classification of minerals.

OSCILLA'TION (*oscillum*, an image hung on ropes, and swung up and down in the air). The swinging or vibratory motion by which a body, when made to change its place, returns in a direction opposite to that in which it first moved. The motion of a pendulum, or that of a string of any musical instrument strained tight by the finger, belongs to this class of motion.

Oscillation, Centre of. That point in an oscillating pendulum, in which the whole moving force is concentrated, and at which, if it meet with resistance, it will instantly stop, without vibration or strain of its other parts. This point differs from the *centre of gyration*, because the motion of the body is produced by the gravity of its own particles; whereas, in *gyration*, the body is put in motion by some other force, acting at one place only. See *Percussion.*

OS'MELITE (ὄζω, to smell). A mineral occurring on calcareous spar, mixed with datholite, and emitting at the ordinary temperature of a room a distinct clayey smell, whence its name is derived.

O'SMIUM (ὀσμὴ, odour). A metal discovered in 1803, in the grains of native platinum, together with iridium, and named from the pungent and peculiar smell of its oxide.

OSSEOUS BRECCIA (*osseus*, bony). The cemented mass of fragments of bones of extinct animals found in caverns and fissures.

OS'TIOLUM (dim. of *ostium*, a door). A little door; the orifice of the perithecium of some fungaceous plants.

OSTRACEÆ. The Oyster tribe; an order of the Conchiferous Mollusca, named from the genus *ostrea*, in which the two halves of the mantle are separated the whole way round, or the foot is absent or very small; they are usually fixed by the shell to solid bodies.

OSTRA'CIDÆ. Oysters; a family of the atrachian bivalves, named from the genus *ostrea*; the animal is sedentary, generally affixed by the under valve; the shell is foliaceous, rarely pearly.

OSTRACO'DA (ὄστρακον, a shell, εἶδος, form). A family of the Entomostraca, comprising those which have the shell folded so as to resemble those of bivalves.

OSTRO'PODA. An order of the entomostracous Crustacea, in which the body is entirely enclosed under a large shield having the form of a bivalve shell. The animals of this order are commonly termed *monoculous*, from the two eyes being united into one mass.

OTO'LOPHI (οὖς, ὠτὸς, the ear, λόφος, a crest). A group of Batrachians, which have the muzzle angular, and the head furnished on each side with a crest which extends over the parotid portion.

OUTLIER. A term applied by some mineralogists to a portion of a stratum which occurs at some distance, detached from the general mass of the formation to which it belongs.

OVAL (*ovum*, an egg). A curve drawn by taking a string of any certain length, and fixing, not one end as in drawing the circle, but both ends to different points, and then carrying a point outside the string, always keeping it stretched as far as possible. The name of this figure is derived from its resemblance to the transverse section of an egg. *Ellipses* are ovals which are formed by the above fixed law, but the latter is a popular term for any curved figure, approaching to that shape. The carpenter's oval, for example, is made up of circular arcs, which unite without leaving any angular appearances at their junctures.

Ovals of Descartes. These, though not Ellipses, are governed by a determinate law, which constitutes them as varieties of that curve. As in the Ellipse the two lines drawn from the foci to any point of the circumference vary, so that the increment of one shall always be equal to the simultaneous decrement of the others; so, in the *Cartesian Ovals*, these increments are in an invariable ratio. "These curves may therefore be defined the *locus* (place) of the vertex of a triangle, on a given base, one of whose sides bears a given ratio to the sum or difference of a given line and the other side."

OVARIUM OF PLANTS. The hollow case at the base of the pistil, enclosing the ovules. It is said to be *inferior*, when the tube of the calyx contracts adhesion with its sides; *superior*, when no such adhesion exists. Hence, an inferior ovary involves a *superior calyx;* a superior ovary, an *inferior calyx*. When an ovary adheres to the calyx merely by its back, it is termed *parietal.*

OVERLYING ROCKS. *Interjected Rocks.* A geological term applied to those rocks which appear lying over, or interspersed among, the stratified rocks. They are probably connected with deposits situated beneath the fundamental, having apparently been ejected in a melted state, through fissures in the strata.

OVERSHOT WHEEL. A water-wheel, to which the water is conveyed over the top of the wheel, and applied above the axle; in this case the water acts merely by its weight, and not by the impulse of the stream.

OVI'GEROUS (*ovum*, an egg, *gero*, to bear). A term applied to parts which contain or support the egg.

OVI'PAROUS (*ovum*, an egg, *pario*, to bring forth). A designation of those animals, which produce their young in an egg, the egg being hatched after its exclusion from the parent, as in the cases of birds and most reptiles.

OVIPO'SITOR (*ovum*, an egg, *pono*, to lay down). An instrument with which some Hymenopterous insects are furnished for depositing their eggs. It is formed by a prolongation of the last segment of the body in the females, and possesses the power of boring a hole in certain substances. In other insects of this order, the *ovipositor* is replaced by a *sting.*

OVO-VIVI'PAROUS (*ovum*, an egg, *vivus*, alive, *pario*, to bring forth). A designation of those animals which bring forth their young in the living state, the egg having been previously hatched within the body of the parent.

OVULE OF PLANTS. A small pulpy body, borne by the placenta, and gradually changing into a seed. It consists of two tunics and a nucleus.

OVU'LINÆ. The egg-shells; the subtypical group of the *Cypræidæ*, or Cowries, named from the genus *ovula*, and resembling the cowries in general form; but the extremities of the aperture are generally produced, and there are no teeth to the inner lip.

OXA'LIC ACID. An acid existing, in the form of an acid salt of potash, in many plants, particularly in the species of *Oxalis* and *Rumex*; combined with lime, it forms a part of several lichens.

OXALIDA'CEÆ. The wood-sorrel tribe of Dicotyledonous plants. Herbaceous plants, undershrubs, or trees, with *leaves* alternate; *flowers* symmetrical; *stamens* hypogynous; *fruit* capsular.

O'XAMIDE. A white insoluble sublimate, obtained by decomposing oxalate of ammonia by heat. The term is derived from the first syllable of oxalic acid and ammonia.

OXFORD CLAY. Clunch clay; a great argillaceous bed interposed between the lower and the middle oolite. It is of a dark blue colour, some of the beds are bituminous, and abound in septaria, or masses having internal dissepiments. In its lower part are beds of limestone called *Kelloway Rock.*

OXIDA'TION. The process of converting metals or other substances into oxides, by combining with them a certain portion of oxygen. It differs from *acidification*, in the addition of oxygen not being sufficient to form an acid with the substance oxidated.

O'XIDE. A generic term, consisting of the first syllable of oxygen with a termination indicative of combination, applied to compound neutral bodies and bases. To this the name of the other element is joined, to express the specific compound. Thus, a compound of oxygen and hydrogen is *oxide of hydrogen;* if oxygen and potassium, *oxide of potassium*; of which compounds the first, or water, is an instance of a neutral oxide; the second, or potash, of a base or alkaline oxide. But the same elementary body often combines with oxygen in more than one proportion, forming two or more oxides; to distinguish them, the following prefixes are employed:—

1. *Proto* (πρῶτος, first), denoting the minimum of oxygen, as *proto*xide.

2. *Deuto* (δεύτερος, second), denoting a second proportion, as *deut*oxide. This is also called *bin*-oxide.

3. *Trito* (τρίτος, third), denoting a third proportion, as *trit*oxide. This is also called *ter*-oxide.

4. *Per* (*very much*), denoting the maximum of oxidation, as *per*oxide.

OXY (ὀξὺς, acid). A prefix, denoting in some terms, the presence of *acidity;*

in others, the presence of *oxygen;* in a third class of terms, *acuteness of sense* or function; and, lastly, *sharp-pointedness.*

O'XYGEN (ὀξὺς, acid, γεννάω, to generate). The name given by Lavoisier to an elementary body, with reference to its property of forming acids with other elementary bodies. Oxygen is a permanent gas, when uncombined, and forms one-fifth part of the atmospheric air. By Priestley it was called dephlogisticated air; by Scheele, empyreal air; by Condorcet, vital air.

O'XYSTOMES (ὀξὺς, sharp, στόμα, a mouth). The name given by Milne Edwards to the fourth and last family of brachyurous crustaceans, comprising all those species which most resemble the type, especially in the conformation of the buccal apparatus.

O'ZON (ὄζω, to smell). The name given by Schönbein to the odorous principle emitted during the action of an electrical machine. He considered it to be a body contained both in air and in water; that it had hitherto escaped the observation of chemists; and that, under certain circumstances, it was set free by electricity. It is probably a trit-oxide of hydrogen.

P

PACHYCEPHALI'NÆ (παχὺς, thick, κεφαλὴ, head). The name given, in Mr. Swainson's classification of birds, to the Great-headed Chatterers, the second sub-family of the Ampelidæ, or Chatterers.

PACHYDE'RMATA (παχὺς, thick, δέρμα, skin). An order of the Mammalia, comprising thick-skinned animals, as the elephant, the rhinoceros, &c., and certain aquatic animals, approaching to the hippopotamus.

PACKFONG. The white copper of the Chinese, said to be an alloy of copper, nickel, and zinc. It is also called German Silver.

PA'GINA. Literally, a page of a book; hence, applied to a surface of a leaf, *pagina superior* being the upper, *pagina inferior* the lower surface.

PA'GODITE. A species of steatite or serpentine, which the Chinese carve into figures.

PAGU'RIANS. A tribe of anomourous crustaceans, named from the genus *pagurus*, and known by the popular names of *Hermit-crabs* and *Soldier-crabs;* in France they are called Bernards l'Hermite.

PAIRS, CHEMICAL. In the unorganized kingdom the elementary substances are generally combined by the force of affinity, either two and two in *pairs*, or the pairs themselves forming *double pairs*, and in some few cases even the double pairs united. In the organized kingdom, on the contrary, the four elements do not enter into *binary*, but at least into *ternary*, or *quaternary* combinations, without first forming pairs.

PALÆO'GRAPHY (παλαιὸς, ancient, γράφω, to write). The study of ancient documents, including the knowledge of the various characters used at different periods by the writers and sculptors of different nations and languages, their abbreviations, initials, &c.

PALÆONTO'LOGY (παλαιὸς, ancient, ὄντα, beings, λόγος, an account). The science which treats of fossil remains, both animal and vegetable; of their forms and relations, of the changes which they have undergone, and of the causes which have produced their immersion in the strata.

PALÆOSAU'RUS (παλαιὸς, ancient, σαύρα, a lizard). The name of a genus of fossil Saurians discovered in the magnesian conglomerate on Durdham Down, near Bristol, in 1834.

PALÆOTHE'RIUM (παλαιὸς, ancient, θηρίον, a wild beast). A fossil extinct quadruped, belonging to the order Pachydermata, resembling a pig, or tapir, but of great size.

PALÆOZO'IC SERIES (παλαιὰ ζῶα, ancient animals). A name given to the fossiliferous strata of earlier geological date than the carboniferous system, and the mountain limestone, with reference to their organic contents. The term *Protozoic* has been applied to these early groups of strata; but this term, it has been observed, seems to assert more than is necessary, perhaps more than is known.

PALEA. Chaff. The term *paleæ* is

applied to the minute colourless bracts at the base of the florets of a capitulum; and to the floral envelope of grasses, which immediately surrounds the sexual organs.

Paleaceous. Chaffy; covered with paleæ, or membranous scales, as the receptacle of some compositæ.

PALLADIUM. A new metal found by Wollaston in the ore of platinum.

PALLAS or OLBERS. A telescopic planet, discovered by Dr. Olbers, in 1802, and situated in the solar system between Mars and Jupiter. Its diameter is unknown. It describes its orbit round the sun in four years, seven months, and eleven days. Its distance from the sun is 267 millions of miles.

PA'LLIAL IMPRESSION. The mark formed in a bivalve shell by the *pallium* or mantle. It occurs usually near the margin of the shell, and is, hence, sometimes called the *marginal impression.* In the Dimyaria, this mark passes from one impression of the muscles of attachment to the other; if, in its passage, it bends inwards posteriorly, it is said to be *sinuated*, and the part where this occurs is the *siphonal scar* of Mr. Gray.

PA'LLIOBRANCHIA'TA (*pallium*, a mantle, *branchiæ*, gills). A term originally proposed by Blainville for the *Brachiopodous* mollusca, notwithstanding his belief that the spiral arms were the organs of respiration. It has since been proved by Owen to be strictly appropriate, and is applied by him to the class of acephalous mollusca, in which the gills are developed from the mantle.

PALMA'CEÆ. The Palm tribe of Monocotyledonous plants. Plants with an arborescent trunk, covered with the sheathing bases of leaves; *leaves* terminal, clustered, pinnate, or flabelliform; *flowers* hexapetaloïdeous, stamens definite; *ovarium* superior, 3-celled; *fruit* baccate, or drupaceous, with fibrous flesh.

PALMATE LEAF. A form of leaf, having five lobes, with the midribs radiating from a common point at the base of the leaf, and resembling the palm of the hand. The palmate leaf admits of the following varieties, which occur in botanical descriptions:—

1. *Palmatifid,* in which the lobes are divided as far down as half the breadth of the leaf.

2. *Palmatilobate,* in which the lobes are divided to an uncertain depth.

3. *Palmatipartite,* in which the lobes are divided beyond the middle, and the parenchyma is not interrupted.

4. *Palmatisected,* in which the lobes are divided down to the midrib, and the parenchyma is interrupted.

PALMI'PEDES (*palma*, the palm of the hand, *pes*, the foot). *Natatores.* Swimmers; an order of web-footed birds, capable of swimming in the water the instant they are liberated from their egg-coverings. They comprehend the divers, pelicans, albatrosses, swans, &c.

PA'LPI (*palpo*, to touch). The organs of touch developed from the labium and maxillæ of insects, commonly called *feelers.*

PALPICO'RNES (*palpi*, feelers, *cornu*, a horn). A family of the pentamerous *Coleoptera*, characterized by the presence of antennæ with club-like terminations, which are usually shorter than one of the pairs of palpi. They are mostly aquatic.

PANDURIFORM (*pandura*, the ancient shepherd's pipe, *forma*, likeness). Fiddle-shaped; obovate, with a deep sinus on each side, as the leaves of rumex pulcher.

PA'NGOLINS. A common designation of the Scaly Ant-eaters, derived from a Javanese word signifying an animal which rolls itself into the form of a ball. The pangolins correspond with the genus *Manis* of Linnæus.

PANICLE (*panicula*, the woof wound round the quill in the shuttle). A form of inflorescence, in which the flower-buds of a raceme have, in elongating, developed other flower-buds, as in the oat. When the rachis of inflorescence separates irregularly into branches, so as to lose the form of an axis, this is called by Willdenow a *deliquescent panicle.*

PANTOCHRONO'METER (πᾶς, παντὸς, all, χρόνος, time, μέτρον, a measure). An instrument which combines the use of the compass, of the sun-dial, and of the universal time-dial.

PAPAVERACEÆ. The Poppy tribe of Dicotyledonous plants. Herbaceous plants with *leaves* divided, alternate; *flowers* polypetalous, single on long peduncles; *petals* 4, or some multiple of 4, cruciate; *stamens* hypogynous; *ovarium* solitary; *seeds* numerous.

PAPER COAL. A bituminous shale, which separates into thin laminæ of coal, like sheets of paper.

PAPILIONACEOUS (*papilio*, a butterfly). A form of corolla resembling a butterfly, and found in all the leguminous plants of Europe. Of the five petals, the uppermost is dilated, and called *vexillum*, or the standard; the two lateral are contracted and parallel, and called *alæ*, or the wings; the two lower are contracted, parallel, generally coherent by their anterior margin, and termed *carina*, or the keel.

PAPPUS (πάππος, the down of the cheek). A botanical term for the feathery appendage which crowns the fruit of many composite plants, being, in fact, a reduced *calyx*. A familiar instance occurs in the down of the dandelion.

PARA- (παρά). A Greek preposition with various meanings, as *through*, *near*, *about*, &c. In some chemical compounds, it denotes *near to*, and expresses a close alliance between two compounds.

PARA'BOLA (παραβολή, the Conic Section *parabola*, so named because its axis is *parallel* to the side of the cone). A section of a cone by a plane parallel to one of its sides; it is therefore an open curve, which would spread out wider and wider, if the cone were extended. A simple illustration of the parabola is the curved line described by a body thrown *forward*, as of a bullet from a gun, a jet of water from a fire-engine, &c.

Paraboloid. A geometrical solid, formed by the revolution of a parabola round its axis (See *Conoid*). The term is also applied to two surfaces of the second degree, viz. the *elliptic paraboloid* and the *hyperbolic paraboloid*, which answer to the curve parabola.

PARACE'NTRIC VELOCITY. An expression denoting the rate at which a moving body approaches a certain *centre*, without reference to the rate at which it moves in space.

PARACEPHALO'PHORA (παρά, beside, κεφαλή, the head, φέρω, to carry). The name given by De Blainville to a class of molluscous animals, in which the head is but little distinct from the body, but is always provided with some of the organs of sense. They are divided into the sub-classes *dioica*, *monoica*, and *hermaphrodita*.

PARADI'SIDÆ. The Birds of Paradise; a family of the *Insessores*, or Perchers, characterized by the extraordinary development of their feathers. They are confined to New Guinea and the neighbouring islands. See *Tenuirostres*.

PA'RADOX (παραδοξία, marvellousness). A statement which is opposed to general belief, being, at its first enunciation, apparently contradictory of some established maxim or truth. Thus, "the wise man alone is rich," is a paradox, for the statement would be ridiculed by all, except the wise.

PA'RAFFIN. *Petroline.* A particular hydrocarbon produced in the distillation of wood. Its name is derived from *parum affinis*, denoting its remarkable indifference to other bodies in a chemical point of view.

PARALLA'CTIC INSTRUMENT. *Ptolemy's Rules.* An astronomical instrument invented by Ptolemy for determining the moon's parallax, and described in his *Almagest*.

PA'RALLAX (παράλλαξις, alternation). Parallax may be generally defined to be the change of the apparent situation of an object arising from a change of the real situation of the observer. In astronomical language, the word has a more technical meaning, and is restricted to the difference of the apparent positions of any celestial object when viewed from a station on the *surface* of the earth, and from its *centre*. The centre of the earth is the general station to which all astronomical observations are referred: but, as we observe from the surface, a *reduction to the centre* is needed; and the amount of this reduction is called parallax.

1. *Parallax, diurnal and annual.* By the preceding paragraph it is plain that the parallax of a body signifies the difference between its *apparent* place and its *true* place, or that in which it would be seen, if the observer were situated at the centre to which the motion is referred. When the point of reference is the centre of the earth itself, the change of aspect is called the *diurnal parallax;* when it is the centre of the earth's orbit, the change is called the *annual parallax*, or parallax of the great orb. The latter is the angle under which the semidiameter of the earth's orbit would be seen from a superior planet, or from a fixed star.

2. *Parallax, horizontal.* The parallax changes with the planet's distance from the earth, and also with its altitude above the horizon. It is nothing when the planet is in the zenith; and greatest, the distance from the earth remaining the same, when the planet is in the horizon. In the latter case, it is called *horizontal parallax.* Thus, by saying that the moon's horizontal parallax is 58′ on a certain day, we mean that the moon's distance is such, that if she were in the horizon of any place, the spectator's de-

scent to the centre of the earth would elevate her 58′ above the rational horizon drawn through the centre.

3. *Parallax, angle of.* In Optics, the angle of parallax is that angle which the axes of the eyes, when directed towards an object, form with it at their point of contact. This angle becomes greater as the object is nearer.

PARALLELE′PIPED (παραλληλεπίπεδον, a body with parallel surfaces). A hexahedron, all whose faces are parallelograms, and each pair of faces which do not actually intersect are parallel. A prism whose bases are parallelograms is called a *parallelepiped.* If the bases of a rectangular parallelepiped be squares, and the attitude be equal to the side of the base, all its faces will be squares, and such a parallelepiped is called a *cube.*

PARALLE′LOGRAM (παραλληλόγραμμος, bounded by parallel lines). A quadrilateral figure, whose opposite sides are parallel. The term, as thus defined, is applicable to the square, the rectangle or oblong, the rhombus or lozenge, and the rhomboid; but these terms are significant of relations existing between the angles, as well as the sides of the figures.

PARALLELS (παράλληλος, beside one another, side by side). In Astronomy, the term *Parallels* denotes those circles which every point of the earth between its poles describes by its diurnal rotation, and which run, as it were, side by side of one another.

Parallels Mathematical. Parallel right lines are such as are in the same plane, and which, being produced continually in both directions, would never meet.

PARA′METER (παραμετρέω, to measure by, or with, another thing). A term originally applied to a constant straight line belonging to each of the conic sections, and synonymous with *latus rectum;* that is, the perpendicular drawn to the axis through a focus, terminated both ways by the curve, was the parameter of the curve. The term was afterwards applied, in a general sense, to the constant quantity which enters into the equation of a curve. In the language of astronomy, what were formerly called the *parameters* of the orbits, are now generally called their *elements.*

PARASI′TA. The Louse tribe; an order of "familiar" insects, which are entirely wingless, do not undergo metamorphosis, but agree with the true insects in having only six legs. The term parasite, derived from παρὰ, and σῖτος, provisions, denotes, in its original sense, a hanger-on at the tables of the great.

PARATO′NNERE. The French term for a *lightning conductor,* or metallic rod, made to project above the highest part of a building, and continued down to the ground; its object being to promote the discharge of an electric cloud, and to conduct the lightning to the ground without injuring the building.

PARE′NCHYMA (παρέγχυμα, any thing poured in beside). The name given by Erasistratus to the peculiar substance of the lungs, liver, kidneys, and spleen, as if *formed separately* by the blood of veins which run into those parts: the word σὰρξ he used only of the muscular flesh. The term is generally applied to the soft tissue of organs, in plants and animals, particularly to that of the glands.

PARHE′LION (παρὰ, near, ἥλιος, the sun). A mock sun, or meteor, of a brilliant light, resembling the sun, and occasionally accompanying halos. The term *parhelion* denotes an image of the sun formed by reflection from a cloud.

PARIE′TAL (*paries,* a wall). A term applied to any thing which is attached to the wall of an organ, as to the placenta of plants, when attached to the walls of the ovary, as in poppy, violet, &c.

PA′RINÆ (*parus,* the tit). Parine birds or Tits; a family of the *Cantatrices* of Macgillivray, somewhat allied to the kinglets and the jays, although, from their diminutive size, they seem at first sight to have little affinity to the latter.

PARI-PINNATE. Equally pinnate, abruptly pinnate; applied to a pinnate leaf of which the petiole is terminated neither by a leaflet nor a tendril.

PARO′NYMOUS WORDS (παρώνυμος, formed from a word by a slight change). Words which belong to one another, as the substantive, adjective, verb, &c. of the same root. These have not in every case a precisely correspondent meaning, and the careless or designed application of them may lead to the logical *fallacia figuræ dictionis,* which properly belongs to the case of Ambiguous Middle. Thus, "*Projectors* are unfit to be trusted: this man has formed a *project;* therefore he is unfit to be trusted." Here the sophist proceeds on the hypothesis that he who forms a *project* must be a *projector:* whereas the bad sense which commonly attaches to the latter word, is not at all implied in the former. *Whately.*

PART, LOGICAL. *Logically*, species are called parts of the genus they come under; and individuals, parts of the species. *Really*, the genus is a part of the species; and the species, of the individual.

PA'RTICIPLE. A part of speech said to have derived its name from its *partaking* of the nature both of the verb and of the noun. Horne Tooke calls it a "verb adjective."

PA'RTICLE (*particula*, a little part). The term applied by grammarians to those parts of speech which are indeclinable, and are neither nouns nor verbs, but express the relations, connexions, and modifications of ideas. In this sense, particles comprehend adverbs, conjunctions, prepositions, and interjections.

PARTICULAR PROPOSITION. In Logic, a proposition in which the predicate is affirmed or denied of some part only of the subject.

PARTITE LEAF. In Botany, a leaf is so called when it is parted or divided into a fixed number of segments, which are separated nearly down to the base; a leaf with two such divisions is said to be *bipartite*; with three, *tripartite*; with many, *pluripartite*, &c.

PASSERI'NÆ (*passer*, a sparrow). Passerine birds or sparrows; a family of the *Deglubitrices* of Macgillivray, differing little from the Emberizinæ of that author, except in the form of the bill, and in having the upper mandible broad and concave, instead of being narrow and furnished with a prominent knob. By other writers, the Passerine birds are included in the Fringilladæ or Finches, a family of the Insessores or Perchers.

PATENT YELLOW. A pigment consisting of chloride and protoxide of lead; also called *mineral yellow*.

PAVO. The Peacock; a modern southern constellation, consisting of fourteen stars, and occupying a part of the space situated between Sagittarius and the South Pole.

PAVO'NIDÆ (*pavo*, the peacock). The Peacock family, the first family of Rasorial birds, in Mr. Swainson's arrangement. The term *Phasianidæ* is adopted by other writers.

PEA IRON-ORE. The common name of the pisiform variety of argillaceous or clay iron-stone.

PEA-STONE. Pisiform limestone; a sub-species of limestone, occurring in round granular concretions.

PEAK. When the summit of a mountain rises with an acclivity more abrupt than the rest of the mountain, it is usually, whether conical or not, called a *peak*. When very slender pointed rocky protuberances form the summits, they are called by the French *aiguilles*, or needles, but by us generally peaks.

PEAR GAGE. An instrument invented by Smeaton for measuring the degree of the rarefaction of air, and named from its peculiar form. It is a modification of the air-pump gage.

PEARL. A spherical concretion formed within the pearl oyster, consisting of carbonate of lime and albumen. Sir Everard Home considered that the abortive ova of the animal were the nuclei upon which the pearls were formed.

PEARL-ASH. The name of potash when it is calcined, and of a whitish pearly lustre. It is employed in making flint glass, soap, &c.

PEARL-SINTER. *Fiorite.* A variety of stalagmitic quartz or quartzsinter, found at Santa-Fiora in Tuscany, &c.

PEARL-SPAR. Another name for *brown-spar* or sidero-calcite. It consists of the carbonates of lime and magnesia, with traces of other substances, and occurs abundantly in the lead mines in the north of England, &c.

PEARL-STONE. A sub-species of indivisible quartz, occurring in large beds in clay, porphyry, and secondary traprocks, in Hungary and in Spain.

PEARL-WHITE. The sub-nitrate of bismuth, formerly called *Magistery of bismuth*. From the nitric solution of bismuth is procured a powder of a pearly lustre, used by perfumers under the name of *pearl powder*.

PEAT or TURF. A carboniferous deposit formed in the low parts of plains by the gradual decomposition of successive layers of vegetables, burning with flame and grey smoke, and emitting a pungent and somewhat fetid odour. It occurs wherever the soil has been long soaked with water, which has no means of complete evaporation.

PE'CHBLENDE. An ore of uranium, in which the metal exists in the state of sulphuret.

PE'CORA (plur. of *pecus*, cattle). The fifth order of the Mammalia in the system of Linnæus, where they are placed between the orders *glires* and *belluæ*.

PECTIC ACID (πηκτὶς, a coagulum). A substance obtained from the carrot and other vegetables, so named from its remarkable tendency to gelatinize.

PECTIN (πηκτὶς, a coagulum). The name given by Braconnot to a principle which forms the basis of vegetable jelly.

PE'CTINATE (*pecten*, a comb). In Botany, a term expressing a modification of the pinnatifid leaf, in which the segments are long, close, and narrow, like the teeth of a comb.

PE'CTINATED (*pecten*, a comb). Having processes resembling in form and arrangement the teeth of a comb, as the spines of some species of *murex*.

PE'CTINIBRANCHIA'TA (*pecten, pectinis*, a comb, *branchiæ*, gills). The name of the sixth, the most highly organized and the most numerous order of *Gasteropods*, including all the inhabitants of spiral univalve sea-shells, and many with shells simply conical, which have their comb-shaped gills placed internally in a capacious cavity, into which the water is freely admitted.

PECTI'NIDÆ. A tribe of Monomyarian conchifers, including the pectens, the limæ, the oysters, &c.

PECTORA'LES PEDU'NCULATI. A family of *Acanthopterygious* fishes, in which the pectoral fins are attached to the bones by a peduncle, resembling a wrist, enabling the fish to leap in pursuit of its prey, as in the lophius, or fishing-frog.

PE'DAL (*pes, pedis*, a foot). A foot-key in musical instruments, or a lever for acting on the swell of the organ or the piano-forte. A *pedal-base* is a base which remains stationary on one note, while the other parts continue to move and form various chords which are related to the pedal-base according to the laws of harmony.

PEDATE. A botanical designation of that form of the palmate leaf, in which the two lateral lobes are themselves subdivided, as in helleborus niger. The same modifications occur as in the palmate leaf, with similar terms, as pedatifid, pedatipartite, pedatisected, and pedatilobate.

PEDICELLA'RIÆ (*pedicellus*, a little stalk). The name of certain appendages to the integument of the Echini and other echinodermata, consisting of a dilated end or head, usually prehensile, supported by a slender stem or pedicel. They have been distinguished by Valentin into the *gemmiform*, the *tridactyle*, and the *snake-headed*, or ophicephalous.

PEDIPA'LPI (*pes, pedis*, a foot, *palpi*, the organs of touch in insects). A division of the *Arachnida*, in which the palpi are exceedingly strong, and furnished at their extremity with a prehensile forceps, as in the scorpion.

PEDO'METER (πέδον, the ground, μέτρον, a measure). An instrument for measuring the distance which a person has performed by walking or riding. It is of a portable size, and its operation is effected by motion communicated to its machinery by the traveller himself.

PE'DUNCLE and PE'DICEL. In botanical language, the *peduncle* is that part of the inflorescence which proceeds immediately from the stem. If it is divided, its principal divisions are called branches; and its ultimate ramifications, which bear the flowers, are named *pedicels*. There are modifications of the peduncle, to which other names are applied. See *Rachis* and *Scape*.

PEDU'NCULATE (*pedunculus*, a foot-stalk). That which is supported on a peduncle, or foot-stalk, as the shell of *Terebratula*, or a flower furnished with a stalk. See *Sessile*.

PE'GASUS. The Flying Horse; one of the old northern constellations, consisting of eighty-nine stars.

PE'GMATITE. A granular mixture of quartz and felspar. It often occurs in granite veins and passes into Graphic Granite, from which some geologists do not distinguish it.

PELECA'NIDÆ. The Pelican tribe; a family of the *Natatores*, or Swimming birds, characterized by having the hind toe united by membrane to the rest. They are, nevertheless, almost the only birds of the order which perch upon trees. They include the pelican, the cormorant, the frigate-bird, the gannet, and the boobie.

PELIO'MA. *Iolite*. A blue-coloured mineral, belonging to the garnet tribe, now commonly called *dichroite*, from its exhibiting two different colours when viewed in different positions.

PELLICLE (dim. of *pellis*, the skin or hide of a beast, flayed off). A thin skin, or film. Among chemists, it denotes a thin surface of crystals uniformly spread over a saline liquor evaporated to a certain degree.

PE'LOKONITE. An amorphous mineral, of a bluish-black colour, containing phosphoric acid, iron, manganese, and copper.

PE'LTATE (*pelta*, a shield). Shield-shaped; a term applied by botanists to leaves which are fixed to the petiole by their centre, or by some point within the margin, as in tropæolum.

PE'NCIL (*penicillus*, any thing which has its end divided like a painter's brush). In optics, a pencil of rays is a collection of rays which converge to, or diverge from, a point; in geometry, a pencil of lines is a series of lines which meet in a point.

PE'NDULUM. Every solid body which is freely suspended, is called a *pendulum.* A distinction is made between the *simple* or *mathematical*, and the *compound* or *physical* pendulum. The former is regarded as an inflexible imponderable line suspended at one end, its other end being considered as a point possessing weight. A pure mathematical pendulum has no actual existence. All such as actually exist are *physical* pendulums, every material particle of which acts as the heavy point of the simple pendulum. A *seconds pendulum* is one whose vibration occupies one second.

PENI'NSULA (*pene*, nearly, *insula*, an island). A part of a continent which runs out into the sea, and is joined to the main land by only a small portion of its circumference. If the projections of land reach but a little way into the sea, they are called *capes*, *promontories*, or *headlands*.

PENNATU'LIDÆ (*pennatula*, a little feather). A family of cortical polyps, in which the whole animal resembles a feather, the stem supporting lateral branches, upon which the polyps are arranged.

PENTA'CRINITE (*πέντε*, five, *κρίνον*, a lily). A pedunculated star-fish with five rays, for the most part fossil. The animal is so complicated that the number of separate pieces of stone of which its singular skeleton is made up has been calculated to amount to not fewer than one hundred and fifty thousand.

PE'NTAGON (*πέντε*, five, *γωνία*, an angle). A plane geometrical figure, bounded by five sides, and consequently having five angles. When the sides and angles are all equal, the pentagon is called *regular*, and then the square of its side is equal to the sum of the squares of the sides of the hexagon and decagon inscribed in the same circle as the pentagon.

PENTA-GYNIA (*γυνὴ*, a woman). Having five pistils; an *ordinal* character of plants in the system of Linnæus.

PENTAKE'NIUM. The name given by Richard to that modification of the *polakenium*, in which the fruit, so designated, has *five akenia*, or cells. See *Cremocarpium.*

PENTA'MERA (*πέντε*, five, *μέρος*, a part). A section of *Coleopterous* insects, in which the tarsi of all the feet are five-jointed, the fourth being of ordinary size. *Latreille.*

PENTA'NDRIA (*πέντε*, five, *ἀνὴρ*, a man). Having five stamens; the characteristic feature of the fifth class of plants in the system of Linnæus.

PENU'MBRA (*pene*, almost, *umbra*, a shadow). A partial shadow; an intermediate shade between pure shadow and light; a shadow which receives only a portion of the rays of a luminous body, when that body has a measurable diameter. It occurs in solar and lunar eclipses, in the form of two diverging spaces, one on each side of the cone of *umbra*, or pure shadow, caused by the interception of the sun's rays. In a solar eclipse, so long as any part of the sun is visible, the observer is in the penumbra, and not in the umbra or complete shadow.

PEPERI'NO. An Italian name for a particular kind of volcanic rock, formed, like tuff, by the cementing together of volcanic sand, cinders, scoriæ, &c.

PEPO. A gourd; a three-celled fleshy indehiscent fruit, with parietal placentæ, as the cucumber. Richard uses the term *peponida.*

PE'PSIN (*πέπτω*, to digest). A peculiar animal principle secreted by the stomach and present in the gastric juice.

PER. A Latin preposition, which, when prefixed to the name of an oxide, indicates the presence of the greatest quantity of oxygen which can exist in a compound, as in *per*-oxide.

Bi-per. This double prefix is used, when there is more than one atom of oxygen in the base, as well as an unequal number of atoms of acid and base, as in the *bi-per*-sulphate of mercury, where *bi* indicates the presence of two atoms of acid, and *per* that the mercury is in the form of a *per-oxide.*

PER ACCIDENS. A term formerly employed in philosophical language to denote an effect which does not follow from the nature or essence of the thing, but from some accidental circumstance or quality; in this sense, it is opposed to the term *per se:* thus, fire burns *per se;* a red-hot iron burns *per accidens.*

In Logic, the term *per accidens* is

applied to that mode of conversion of a proposition in which the quantity is changed, or limited from universal to particular. This might fairly be named conversion by *limitation*, but is commonly called *conversion per accidens*.

PERCE'PTION. The mental faculty by which we hold communication with the actual world. 1. It is thus distinguished from *conception*, which relates to that which has no reality: we *perceive* the present order of things, we *conceive* of the future. Thus the ancients distinguished the αἰσθητὰ, or objects of perception, from the νοητὰ, or objects of conception. 2. Perception differs from *consciousness*, in the subjects of the former being external, those of the latter internal: we *perceive* a mountain, we are *conscious* of a thought. 3. It differs from *remembrance*, in respect to the subjects being present or past: we *remember* a former object of perception, but we do not *perceive* it until it is again present. 4. But the term "perception" is vaguely applied by some writers to all operations and states of mind, comprising the passions, and all the phenomena of memory and of imagination.

PE'RCIDÆ (*perca*, the perch). The Perch tribe; a family of *Acanthopterygious*, or spiny-finned fishes. In the *thoracic* species, the ventral fins are placed under the pectoral; in the *jugular*, upon the throat; in the *abdominal*, on the abdomen.

PERCU'SSION (*percutio*, to strike). A forcible stroke given to a resisting object by a moving body. There is one point of the moving body in which the whole force of the stroke is concentrated, and the resistance to which would neutralize the blow. This point is termed the *centre of percussion*, and it always coincides with that of *oscillation;* and if all parts of the percutient body be carried forward with the same celerity (which is not the case of the pendulum), the centre of percussion is the same with the *centre of gravity*. The *force of percussion* is momentum. See *Momentum*.

PERDICI'NÆ (*perdix*, a partridge). Perdicine birds, or partridges; a family of the *Rasores*, or Scratching birds. There is little essential difference between the large, long-tailed birds, called Cocks and Pheasants, and the small, short-tailed species, called Partridges and Quails. Their habits also are essentially similar.

PERE'NNIBRA'NCHIATE (*perennis*, perpetual, *branchiæ*, gills). A division of Amphibious animals, which preserve their branchiæ through the whole period of their lives, as the proteus, the siren, &c.

PERFECT NUMBER. A number which is equal to the sum of all its divisors. Thus 6 is a perfect number, for its divisors are 1, 2, and 3, and the sum of these is 6. See *Number*.

PERFOLIATE. The designation of a leaf which, by union of its margins, encloses the stem, which thus seems to pass through it.

PERFORATED (*perforo*, to pierce through). Bored, or pierced through, as by an awl; a term applied to the ear-shells.

PERI-, PER- (περί). A Greek preposition, signifying *around*, *about*, expressing the relation of circumference to centre, and so strictly different from ἀμφί.

1. *Peri-anth* (ἄνθος, a flower). A collective term for the calyx and corolla combined, the limits of which are undefined, so that they cannot be satisfactorily distinguished from each other, as in tulip, orchis, &c.

2. *Peri-carp* (καρπὸς, fruit). A botanical term denoting all the parts of a ripe fruit which are on the outside of the real integuments of the seed, except the aril. These parts are, severally, the epicarp, the sarcocarp, and the endocarp.

3. *Peri-cladium* (κλάδος, a young branch). A term sometimes applied to the lower part of a petiole, when this part sheaths the branch, as in Apiaceæ.

4. *Peri-chætium* (χαίτη, seta, a hair). A term applied to the peculiar leaves which surround the base of the seta, or stalk of the sporangium, or seed-vessel of mosses.

5. *Peri-clinium* (κλίνη, a couch). The name given by Cassini to the involucrum of composite plants. It is to be lamented that botanists cannot agree in employing the same term for an organ. Besides the above designation of the involucrum, Linnæus called it *calyx communis*, Necker, *perigynandra communis*, and Richard *periphoranthium*.

6. *Per-enchyma*. In the nomenclature of vegetable tissues propounded by Morren, this term is applied to the *amylaceous granules* contained within the tissue of plants.

7. *Peri-gee* (γῆ, the earth). That point in a planet's orbit in which it is nearest to the earth. Its *apogee* is that point in which it is furthest from the earth.

8. *Peri-gonium* (γονὴ, generation). A term synonymous with perianthium, and denoting the parts which surround the organs of generation in plants, viz. the floral envelopes.

9. *Peri-gynium* (γυνὴ, a woman). A term which has been variously employed by botanical writers. Link applied it to the *disk* found in certain plants. With some, it is synonymous with *urceolus;* with others, it relates to the *hypogynous setæ* found at the base of the ovary of cyperaceæ.

10. *Peri-gynous* (γυνὴ, a woman). That condition of the stamens of a plant in which they contract adhesion to the sides of the calyx, as in the rose.

11. *Peri-helion* (ἥλιος, the sun). An astronomical term, denoting the greatest approximation of a planet to the sun. See *Aphelion.*

12. *Peri-meter* (μέτρον, a measure). The bounding line of any plane figure, of whatever parts or shapes that line may consist. The bounding line of a circle, or perhaps of any curve which returns upon itself, is termed the *circumference* or *periphery.*

13. *Peri-œci* (οἶκος, a habitation). Those who live under the same parallel of latitude, whether north or south, but on opposite meridians.

14 *Peri-ostracum* (ὄστρακον, a shell). The epidermis, or membrane analogous to scarf-skin, which covers shell.

15. *Peri-phery* (φέρω, to carry). The line which bounds a circular body; a circumference, as that of a circle, an ellipse, or any other curvilinear figure.

16. *Peri-phyllia* (φύλλον, a leaf.) The term applied by Link to the minute hypogynous scales found within the paleæ of grasses. These little organs have disturbed the nomenclature of botany not a little; for while some call them *corolla,* others call them *squamulæ,* Linnæus *nectarium,* Richard *glumella,* De Candolle *glumellula,* and De Beauvois *lodicula.*

17. *Peri-scii* (σκία, shadow). The inhabitants of the polar circles; those whose shadows make complete revolutions, in consequence of the sun being present for twenty-four hours together. See *Heteroscii.*

18. *Peri-sperm* (σπέρμα, a seed). Another name for the *albumen,* or the substance lying between the integuments and the embryo of the seed. By Richard, the term is applied to the *testa* or spermoderm of other writers.

19. *Peri-sporum* (σπόρος, a seed, a spore). The name given by some French writers to the *hypogynous setæ* found at the base of the ovary of Cyperaceæ. They have also been termed *perigynium.*

20. *Peri-stomians* (στόμα, the mouth). The name given by Lamarck to a family of Gasteropods, consisting of the genera *Valvata, Paludina,* and *Ampullaria.* Cuvier comprises these under his *trochoid pectinibranchians.*

21. *Peri-stomium* (στόμα, the mouth). The membrane, or series of tooth-like processes, which closes the orifice of the theca of mosses. Strictly speaking, it consists of two membranes, and hence we hear of an inner and an outer peristomium. The organ is highly hygrometrical.

22. *Peri-thecium* (θήκη, a theca, or case). The case which contains the reproductive organs of certain fungi. *Peridium* is also a kind of covering of sporidia; *peridiolum* is its diminutive.

23. *Peri-trema* (τρῆμα, a hole). The raised margin which surrounds the breathing holes of scorpions.

24. *Peri-tropal* (τρέπω, to turn). A botanical term applied to the embryo of the seed, when it is directed from the axis to the horizon.

PE'RICLINE. A felspathic substance, united by some mineralogists with *ice-spar,* and found in the Tyrol, St. Gothard, &c.

PERIDOTE. *Chrysolite.* A silicate of magnesia, constituting *olivine* in its purer state.

PERIOD. The time occupied by a planet in making a revolution round the sun; or the duration of its course till it returns to the same point of its orbit. In Arithmetic, a period is the recurring part of a circulating decimal. For its chronological meaning, see *Cycle.*

PERIO'DIC ACID. An acid consisting of iodine and oxygen.

PERIO'DIC FUNCTIONS. Trigonometry has for its subject *periodic magnitude,* i. e. magnitude which varies in such a manner as to go through stated cycles of changes, each cycle being a reiteration of the preceding one. *Periodic functions* are those which, performed any given number of times on a variable, reproduce the simple variable itself. Thus $1-x$ and $-x$ are periodic functions of the second order, since

$$1-(1-x)=x, \qquad -(-x)=x.$$

PERIODICAL STARS. Stars which undergo a regular *periodical* increase and diminution of lustre, involving in one or two cases a complete extinction and revival. One of the most remarkable of these is the star *Omicron*, in the southern constellation *Cetus*, first noticed by Fabricius in 1596.

PERIODICAL WINDS. Winds which blow half the year in one direction, and half the year in the opposite direction. October and April are the two months, in which the change in the direction of these winds usually takes place. See *Monsoon*.

PERKINS'S STEAM-ENGINE. A modification of the steam-engine, in which there is no proper boiler, but the water is heated to a high temperature in a cylindrical vessel, called a *generator*, thence discharged through a valve, and immediately converted into steam, having a pressure equal to that of about 35 atmospheres, or of about 500 lbs. on the square inch; the steam at this high pressure is then admitted into a cylinder only 18 inches long and 2 inches wide, the piston of which would perform 200 strokes per minute, and exert a force equal to 10 horse power.

PERLATE ACID. The name given by Bergman to the acidulous phosphate of soda; the phosphate of soda had been previously called *sal mirabile perlatum*. It was named by Guyton-Morveau, *ouretic* acid.

PERMANENT INK. A solution of nitrate of silver, thickened with sap green or cochineal.

PERMANENT WHITE. Sulphate of baryta. At a high temperature it fuses into an opaque white enamel, which is used in the manufacture of fine earthenware, and as a pigment.

PERMEABILITY (*per*, through, *meo*, to pass). That property of certain bodies by which they admit the passage of other bodies through their substance. The cellular tissue of plants is *permeable* by fluids, though at the same time imperforate.

PERMIAN SYSTEM. *Zechstein. Magnesian Limestone Formation.* Under these names is designated a series of well-known deposits which succeed the carboniferous rocks, and sometimes pass into them by insensible gradations.

PERMUTATIONS. By this term is meant the number of *changes* which any quantities, *a*, *b*, *c*, *d*, &c., may undergo with respect to their order, when taken *two and two* together, *three and three*, &c. &c. The number of changes which may be rung upon twelve bells is 479,001,600. See *Combinations*.

PE'RONATE (*pero*, a sort of high shoe). A term applied in botany to the stipes of fungaceous plants, which is thickly laid over with a woolly substance, ending in a sort of meal.

PEROXIDE. A term applied in chemical nomenclature to denote the *highest degree of oxidation*, of which a compound is capable. See *Per*.

PERPENDICULAR. A term applied in geometry to that straight line which, falling upon another straight line, makes the adjacent angles equal to each other. Each of these angles will be a *right angle*.

PERSEUS. A northern constellation consisting of fifty-nine stars, the principal of which is Algenib.

PERSISTENT. A term applied to those parts of plants which do not fall at the usual period, as the corolla of campanula, the calyx of pæonia. See *Caducous*.

PERSONATE (*persona*, a mask). A term applied to that form of the gamopetalous corolla, in which the limb is unequally divided: the upper division, or lip, being arched; the lower prominent, and pressed against it, so that the whole resembles the mouth of a gaping animal, as in antirrhinum. See *Ringent*.

PERSO'NIFICATION. A metaphorical mode of speech by which inanimate objects or abstract ideas are represented as possessed of life and action. Every scholar has enjoyed Virgil's famous personification of the grafted tree:—

"Miraturque novas frondes, et non sua poma."

PERSPE'CTIVE. The application of geometrical rules to the delineation of objects on a plane surface, as connected with the arts of design.

PERTURBA'TIONS (*perturbo*, to disturb). A name applied to those inequalities in the lunar and planetary motions, which arise from the universality of attraction. Thus, not only does the sun attract the earth, and the earth the moon, but these attractions are all reciprocal; and not only is this the case, but each individual planet attracts, and is attracted by, all the rest.

PETAL (πέταλον, a leaf). In Botany, a flower-leaf; one of the divisions of a corolla. In some plants, as in nymphæa, the filament is expanded, and resembles a petal, and is then called *petaloid*.

PE'TALITE. A felspathic substance, in which lithia was first discovered by

Arfvedson. It is a silicate of lithia and alumina.

PETIOLE. The leaf-stalk of a plant, or that which connects the blade with the stem. A leaf so provided is called *petiolate;* if otherwise, *sessile.* When a petiole is divided into several parts, each part bearing a separate leaf or *leaflet,* it is said to be compound, the stalks of the leaflets being called *petiolules* or stalklets.

PETITIO PRINCIPII. A non-logical or material fallacy in reasoning, commonly called *begging the question.* It takes place when a premiss, whether true or false, is either plainly equivalent to the conclusion, or depends on it for its own reception, as if any one should infer the actual occurrence of the eclipses recorded in the Chinese annals, from an assumption of the authenticity of those annals. *Whately.*

PETRIFACTIONS. Stony matters deposited either in the way of incrustations, or within the cavities of organized substances. In the former case, carbonate of lime flows over wood and other organic and destructible matters, of which it preserves the form.

PETROLE'UM (πέτρα, a rock, ἔλαιον, oil). Rock oil, an inflammable liquid bituminous substance, differing from naphtha only in being more inspissated. It receives its name from its oozing, like oil, from the rock. It abounds in the United States, where it is known under the name of *Seneca* or *Genessee* oil.

PETRO'SILEX. A name probably given to two different minerals, viz. compact quartz and compact felspar; the latter has also been termed fusible petrosilex.

PETUNTSE'. A species of felspar, constituting the vitrifying ingredient in Chinese porcelain.

PETWORTH MARBLE. *Sussex Marble.* A variously coloured limestone, occurring in the weald clay, and composed of the remains of fresh-water shells.

PEWTER. A compound metal formed of tin and lead, in the proportions of 80 parts of the former to 20 of the latter.

PHÆNO'GAMOUS (φαίνω, to show, γάμος, nuptials). A term applied to those plants in which the reproductive organs are visible, as distinguished from the *cryptogamous,* in which they are concealed, or of which the function is not understood. The term is synonymous with *phanerogamous.*

PHÆNOMENA (φαίνομαι, to appear). The appearances upon which a *system* or *hypothesis* is founded. Thus the apparent motions of the celestial bodies are phænomena, which have suggested the systems of astronomers. A *hypothesis,* on the contrary, is an assumed cause, by which we endeavour to explain a particular class of phænomena.

PHANERO'GAMOUS (φανερὸς, evident, γάμος, nuptials). *Phænogamous.* A term applied by botanists to those plants in which the organs of reproduction are easily distinguished. They comprise the exogens and endogens of the natural arrangement. See *Cryptogamous.*

PHA'RMACOLITE. *Arsenic bloom.* Native arseniate of lime, occurring in white acicular crystals, in veins together with tin-white cobalt at Andreasberg, &c.

PHA'RMACOSIDE'RITE. Arseniate of iron, occurring crystallized, chiefly in cubes, and hence called by Werner *cube-ore.*

PHARYNGI'NÆ LABYRINTHIFO'RMÆ. A family of *Acanthopterygious* fishes, in which the membranes of the pharynx are divided into small irregular leaves, containing cells, which the fish can at pleasure fill with water; and, by ejecting a portion of this water, it moistens its gills, and is thus enabled to continue its respiration out of its proper element.

PHASES (φάσις, an appearance). A term applied in astronomy to the monthly changes of appearance of the moon. When she appears with a full orb, or with all her surface enlightened, we say the moon is *full.* When a part only of her enlightened hemisphere is towards the earth, and that part is convex, the moon is said to be *gibbous* (gibbus, bunched out). When a half only of her enlightened hemisphere is visible to the earth, we speak of a *half-moon.* When a very small portion of the enlightened hemisphere is towards us, and that concave, the moon is said to be *horned.* Lastly, when none of her enlightened hemisphere is towards us, we say the moon *changes,* or it is *new moon.*

When the moon is full, she is said to be in *opposition* to the sun; when new, she is said to be in *conjunction:* these two positions are called *syzygies.* In the first and the last quarter, half her illuminated portion is visible; these positions are called *quadratures,* and the intermediate points between them and the syzygies are called *octants.*

PHA'SIANE'LLINÆ. Pheasant snails, a sub-family of the *Trochidæ*, or Top Shells, named from the genus *phasianella*, in which the shell is spiral and obovate, the outside polished, and the operculum shelly.

PHASIANI'DÆ. The Pheasant and Fowl tribe of the *Rasores*, or Scratching Birds, distinguished by the shortness of the hind toe, the presence of spurs on the legs, and the beautiful development of the tail. They pass gradually into the *Perdicinæ*, there being no real distinction between them.

PHI'LLIPSITE. A zeolitic substance belonging to that division of the *harmotome* minerals, which contain potass, as distinguished from the baryte-harmotome species.

PHILO'LOGY (φιλολογία). This term, in its strict etymological sense, denotes a *love of talking;* generally, it signifies a love of literature; in modern times it has been restricted to the study of language and history.

PHILOSOPHICAL CANDLE. A bottle fitted with a cork, through which a slender glass or metallic tube passes. On introducing the materials for generating hydrogen, and fixing the cork and tube air-tight, a jet of hydrogen is discharged, which may be ignited by the application of a burning body or an electric spark.

PHILOSOPHY (φιλοσοφία). This term denotes, simply, a *love of knowledge.* But all subjects of systematic inquiry, ranging from that of the operations of the mind to those of the arts and manufactures, have their philosophies; and hence, although the term carries with it no great precision, its application in any particular case is sufficiently obvious.

PHLEGRÆ'AN FIELDS (φλέγω, to burn). *Campi Phlegræi*, or the "Burnt Fields." The country round Naples, so named by the Greeks, from the traces of igneous action every where visible.

PHLŒUM (φλοιὸς, bark). *Peridermis.* The name given by Mohl to one of the layers of bark, the *epi-phlœum* of Link. See *Bark of Plants.*

PHLOGISTON (φλέγω, to burn). A name given by Stahl to an imaginary substance, which was the principle of inflammability. Combustible bodies were supposed to consist of an incombustible base, united to this phlogiston, which escaped during *combustion.* This process is now attributed to the combination of combustible matter with oxygen, which is hence called a *supporter of combustion.*

PHLORIDZIN (φλοιὸς, bark). A substance discovered in the bark of the root of the apple, pear, cherry, and plum-tree. It has been considered as crystallized salicin *plus* two atoms of oxygen.

PHOCENIC ACID (*phocæna*, a porpoise). *Delphinic acid.* A volatile acid contained in train oil or seal oil, and in the berries of *Viburnum opulus.*

PHO'CIDÆ (*phoca*, a seal). The Seal tribe of carnivorous Vertebrata, the *Amphibia* of Cuvier, distinguished by the adaptation of their form and structure to a residence in the water, and of their teeth for retaining a hold on the slippery surface of fish, and crushing them before they are swallowed.

PHŒNICIN (φοίνιξ, purple). Indigo-purple; supposed to be a hydrate of indigo, with two equivalents of water.

PHŒNIX. A modern southern constellation, consisting of thirteen stars.

PHO'LARITE. Hydrated silicate of alumina; a substance occurring in small pearly scales in the coal formation of Fins.

PHO'LIDÆ. A family of macrotrachian bivalves, named from the genus *pholas;* in these the valves are often prolonged in a shelly tube, resembling that of the Tubulibranchiata.

PHONE'TIC WRITING (φωνὴ, sound). A kind of hieroglyphic writing employed by the ancient Egyptians, in which the characters represent, not objects, but *sounds.* The figures representing letters were the likenesses of certain animals or other objects, the names of which began with those letters. The *phonetic* was thus opposed to the *ideographic* writing, in which the characters represented objects, or symbolically denoted abstract ideas. See *Hieroglyphics.*

PHO'NICS (φωνὴ, sound). A term synonymous with *acoustics*, denoting the doctrine of sound. The phenomena of direct, reflected, and refracted sound have given rise to the three respectively corresponding terms of phonics, cataphonics, and diaphonics.

PHONOLITE (φωνὴ, sound, λίθος, a stone). *Clinkstone.* A felspathic rock of the trap family, usually fissile, and named from its sonorous property, when struck with a hammer.

PHORA'NTHIUM (φέρω, to bear, ἄνθος, a flower). The term applied by Richard to the receptacle of composite plants. This is the *thalamus* and *clinanthium* of other writers.

PHOSGENE GAS (φῶς, light, γεννάω, to produce). Chloro-carbonic acid gas; a compound of chlorine and protoxide of charcoal. It is named from the peculiar power of the sunbeam in effecting this combination.

PHOSPHATE. A salt formed by the union of phosphoric acid with a salafiable base.

PHO'SPHITE. A salt formed by the union of phosphorous acid with a base.

PHOSPHORE'SCENCE (φῶς, light, φέρω, to carry). The emission of light by many bodies at a low temperature, unaccompanied by any essential change in their properties. The luminous appearance of common phosphorus is the result of chemical action, for it takes place only when this substance is in combination with oxygen or chlorine.

1. *Phosphorescence by insulation* is a property possessed by many bodies, in consequence of which, after long exposure to the sun's rays, they become luminous in the dark on the application of heat. Of this kind are the *phosphorus of Baldwin*, or the ignited muriate of lime; *phosphorus of Canton*, consisting of oyster-shells, calcined with sulphur; and the *Bologna stone*, or the sulphate of barytes.

2. *Phosphorescence of organic remains in a state of dissolution.* This luminous property occurs in touchwood, and in sea-fish, on which a luminous film is formed. The phosphorescence appears to be owing to a low sort of combustion, as the emission of light decreases on rarefying the air.

3. *Phosphorescence of organic bodies during life.* This occurs in the marigold and yellow lily, a little after sunset, when the atmosphere has been very much heated in July and August. It is probably of an electrical nature. The luminosity of the infusoria, zoophytes, fire-flies, and glow-worms, is a subject of much obscurity.

PHO'SPHORITE. A sub-species of *apatite*, comprising the fibrous and the compact phosphates of lime.

PHO'SPHORUS (φῶς, light, φέρω, to carry). A solid, semi-transparent. colourless substance, of a waxy consistence, undergoing slow combustion at ordinary temperatures; burning brilliantly in air. Combined with lime, it is a principal constituent of the bones of vertebrated animals, and is found in some kinds of limestone.

1. *Phosphorous acid.* An acid produced, in the form of a white volatile powder, by the slow combustion of phosphorus. Its salts are called *phosphites.*

2. *Phosphoric acid.* An acid obtained, in the form of white flakes, by igniting phosphorus under a large bell jar. Its salts are called *phosphates.*

PHO'SPHURET. A compound of phosphorus with a combustible or a metallic oxide.

PHOSPHY'TTRITE. Phosphate of yttria; a very scarce mineral substance, first found in the granite of Lindenäs in Norway, and subsequently in equally small quantities at Ytterby in Sweden.

PHO'TICITE. A mixture of the silicate and the carbo-silicate of manganese.

PHOTOGE'NIC DRAWING (φῶς, φωτὸς, light, γεννάω, to produce). A modern discovery by which objects are represented by the chemical action of light on a prepared metallic tablet, upon which the images of the objects are thrown by a camera obscura. The discovery was made by *Daguerre;* and the apparatus was hence called Daguerreotype; and the process itself photogeny, photography, or heliography.

PHOTO'GRAPHY (φῶς, φωτὸς, light, γράφω, to delineate). *Heliography.* The application of the chemical effects of light to the purpose of rendering permanent the images obtained by means of convex lenses. See *Daguerreotype.*

PHOTO'METER (φῶς, φωτὸς, light, μέτρον, a measure). An instrument for measuring the relative illuminating powers of different sources of light. In Rumford's photometer, the depth of the shadow is the measure used for comparing the intensities of different lights; in Ritchie's, the brightness of the illumination answers the same purpose. When the shadows are equally deep, or when the illuminations are equally bright, the luminous powers of the two sources of light will be as the squares of the distances at which they act.

Leslie's Photometer consists of the differential thermometer with one of the balls blackened. The clear ball transmits all the light that falls upon it, and therefore its temperature is not affected; the black ball, on the contrary, absorbs all the light, and a corresponding elevation of temperature takes place. The action of the photometer depends, therefore, on the heat produced by the absorption of light.

PHRA'GMOCONE (*φράγμα*, a partition, *κῶνος*, a cone). The chambered cone of the shell of the Belemnite.

PHRASE (in Music). This term is defined by Rousseau as a succession of sounds in melody or harmony, expressing an unbroken sense more or less complete, and terminating in a pause, thus forming a cadence more or less perfect. But the notions entertained of this term are various.

PHRENO'LOGY (*φρὴν*, the mind, *λόγος*, an account). The name of a science introduced by Gall and Spurzheim, by which particular characters and propensities are indicated by the conformation and protuberances of the skull.

PHYCOMA'TER (*φῦκος*, sea-weed, *μήτηρ*, mother). The name given by Fries to the gelatine in which the sporules of byssaceous plants first vegetate.

PHYLLI'DIANS. The name given by Lamarck to a family of Gasteropodous molluscs, typified by the genus *phyllidia*, and characterized by the position of the branchia in a circle round the body between the foot and the mantle.

PHYLLO'DIUM (*φύλλον*, a leaf). A term applied to the petiole of a leaf, when it is expanded and leafy, and the lamina abortive, as in many species of Acacia.

PHYLLONY'CTERANS (*φύλλον*, a leaf, *νυκτερὶς*, a bat). A primary division of the Cheiroptera, commonly termed the "foliated bats," from the peculiar membranous foliations which in these animals serve the purpose of antennæ.

PHYLLO'PODA (*φύλλον*, a leaf, *ποὺς*, *ποδὸς*, a foot). An order of the branchiopodous crustacea, in which the body is elongated, and the extremities flattened for the purpose of swimming, as in the *branchipus*.

PHYLLOSO'MA (*φύλλον*, a leaf, *σῶμα*, the body). The family of *double-cuirassed crustaceans*, the forms of which are remarkable for their rounded shape and the transparency of their integuments.

PHYLLOSTOMI'NÆ (*φύλλον*, a leaf, *στόμα*, the mouth). A family of insectivorous Cheiroptera, which have the nasal appendage simple and fleshy, and to which the celebrated *vampyre* belongs.

PHY'SALITE. *Pyrophysalite.* A subspecies of prismatic topaz, found in granite at Finbo in Sweden.

PHYSCOSTE'MON (*φυσάω*, to swell, *στήμων*, a stamen). The name given by Turpin to a fleshy body found in certain plants between the base of the stamens and the base of the ovary. It is commonly called the *disk*.

PHYSICAL DEFINITION. A definition which assigns the parts into which the thing defined can be actually divided. Thus, a plant would be defined *physically*, by enumerating the root, stalk, leaves, &c., of which it is composed. *Logically*, it would be defined "an organized being, destitute of sensation," the former of these expressions denoting the *genus*, the latter the *difference*.

PHY'SICS (*φύσις*, nature). That department of science which treats of the properties of bodies, the laws of motion, and the general phenomena of nature. It is commonly termed Natural Philosophy and Mechanical Philosophy. Bacon endeavours to draw a line between physics and metaphysics;—"Physic is that which inquires of the *efficient cause* and of the *matter;* metaphysic, that which inquires of the *form* and *end*."

PHYSIO'GNOMY (*φυσιογνωμονία*). The science or art of judging of a person's character by his outward look.

PHYSIOLOGY (*φύσις*, nature, *λόγος*, an account). The science which treats of the properties of organic bodies, animal and vegetable; of the phenomena which they present; and of the laws which govern their actions.

PHYSO'GRADA. An order of the *Acalephæ*, in which the body is supported in the water by means of one or more bladders, capable of being filled with air at the will of the animal, and which, when partially empty, enable the animal to sink on the approach of danger. These are the *hydrostatic acalephæ* of Cuvier. M. de Blainville considers the Physograda as one of the aberrant or false forms of the Zoophytes, and as animals improperly referred to them.

PHYTO'GRAPHY (*φυτὸν*, a plant, *γράφω*, to write). An account of the rules observed in describing and naming plants.

PHYTO'LOGY (*φυτὸν*, a plant, *λόγος*, an account). That branch of science which treats of the forms and properties of plants.

PHYTO'PHAGOUS (*φυτὸν*, a plant, *φάγω*, to eat). Plant-eating; a term applied to a division of cetaceous animals, and to a tribe of plant-eating gasteropods. See *Zoophagous*.

PHYTO'TOMY (*φυτὸν*, a plant, *τέμνω*, to cut). Vegetable anatomy; the display of the tissues of plants by means of dissection.

PHYTOZO'A (*φυτὸν*, a plant, *ζῶον*, an animal). Animal plants, or polyps; a class of Radiate animals, named from their plant-like forms; the *Zoophytes* of old authors.

PHYTOZOA'RIA (*φυτὸν*, a plant, *ζῶον*, an animal). A term applied by Ehrenberg to those minute aquatic animals which are more commonly termed *infusoria* and *microzoaria*. They are distinguished into the polygastrica and the rotifera.

PI'CAMAR (*in pice amarum*). The bitter principle of tar, and of all empyreumatic products.

PI'CIDÆ (*picus*, a woodpecker). Picine birds, or woodpeckers; a family of the *Scansores*, or Climbing birds, characterized by their long, straight, angular beak, the end of which is compressed into a wedge, adapted to perforate the bark of trees.

PICRO'LITE. A green or yellow mineral consisting chiefly of magnesia; found traversing beds of magnetic iron ore.

PICRO'SMINE (*πικρὸς*, bitter, *ὀσμὴ*, odour). A mineral species, consisting of silicate of magnesia; found in the iron mine of Englesburg, in Bohemia.

PICROTO'XIN. The deleterious principle of the cocculus indicus. It is extracted by means of water and alcohol, and eventually crystallizes.

PIERRE DE TRIPES. The name given to a sub-species of prismatic gypsum, or *anhydrite*, from its convoluted concretions.

PIEZO'METER (*πιέζω*, to press, *μέτρον*, a measure). An instrument for ascertaining the compressibility of liquids.

PILE. An apparatus for exhibiting the phenomena of Galvanism, and consisting, literally, of a *pile* or column of metallic plates of zinc and copper and discs of wet card, placed in succession to one another in a regular order throughout the series.

1. *Dry Pile.* This apparatus, also called *Zamboni's pile*, after its inventor, differs from the hydro-electric batteries principally in this, that the presence of the electromotive liquid is dispensed with, its place being occupied by some moist substance of low conducting power, generally paper. It agrees, therefore, mainly with the description given above, and the term "dry" is inappropriate.

2. *Pile of two elements only.* This apparatus, also an invention of Zamboni, consists of one metal and one intermediate conductor, either dry or moist. These piles acquire at their poles a feeble electrical tension, the metallic pole exhibiting positive electricity in the dry pile, and the pointed end of the metal being positively electrified in the moist pile.

3. *Secondary piles.* These, sometimes called *Ritter's* piles, consist of alternate layers of homogeneous metallic plates, between which some moist conducting substance is interposed. When they stand alone, no electromotive tension is excited; but they are capable of receiving a charge by being placed in the circuit of a powerful Voltaic battery, and of thus acquiring, though in an inferior degree, the properties of the battery itself.

4. *Pile of De Luc.* An electrical column, constructed of pieces of paper, silvered on one side, and alternating with thin leaves of zinc; the silvered surfaces of the paper discs being always in the same direction.

PILEUS. The cap; the botanical term for the uppermost part of an agaric, resembling an umbrella in form.

PILI'DIUM. The orbicular hemispherical shield of lichens, the outside of which changes to powder, as in calycium.

PILOSITY (*pilosus*, hairy). A term applied to that kind of hairiness in plants, in which the hairs are long, soft, and erect, as in the carrot.

PI'MELITE. A green silicious earthy substance, which accompanies chrysoprase, and, like it, owes its colour to oxide of nickel. It is a variety of steatite, found at Kosemutz in Silesia.

PINCHBECK. An alloy of copper, or brass, and zinc, made in imitation of gold. It is sometimes called *tombac*, *similor*, and *petit-or*.

PINIC ACID (*pinus*, the pine). An acid obtained from rosin; it may be regarded as an oxide of oil of turpentine.

PINION. A wheel consisting of fewer teeth than that which it drives. The teeth of a pinion are called *leaves*.

PI'NITE. A talcose substance, consisting of silica, alumina, and oxide of iron; found in granite and in porphyry. By Kirwan it is called *micarelle*.

PINNATE LEAF (*pinna*, a feather, a fish's fin). That form of leaf in which simple leaflets are placed on each side of a common petiole. The same modifications occur as in the palmate leaf, with similar terms, as pinnatifid, pinnatipartite, pinnatisected, and pinnatilobate. A pinnate leaf which has no terminal leaflet or tendril, is said to be *equally* or *abruptly pinnate*.

PI'NNATIPEDS (*pinna*, a fin, *pes*, the foot). An order of birds which have the digits bordered by membrane.

PINNOTHE'RIANS. A tribe of the third family of the brachyurous crustaceans in the arrangement of Milne Edwards, named from the genus *pinnotheres*, and characterized by their peculiar habit of being housed between the mantle-lobes of certain conchifers, as of mytilus, pinna, &c.

PIPE-CLAY. A plastic and tenacious variety of clay, of a greyish-white colour, with an earthy fracture, and a smooth greasy feel; found near Poole in Dorsetshire.

PIPERA'CEÆ. The Pepper tribe of dicotyledonous plants. Shrubs or herbaceous plants, with *leaves* opposite; *flowers* achlamydeous; *stamens* adhering to the base of the *ovarium*, which is superior and one-celled.

PI'PRIDÆ. The name given by Mr. Vigors to a family of the *Dentirostres*, from the genus *Pipra*. Mr. Swainson, rejecting this family, gives the name *Piprinæ* to the manakins, which he makes a sub-family of the Ampelidæ, Fruit-eaters, or Chatterers.

PISCES (*piscis*, a fish). The first class of the *Vertebrata* or *Encephalata*, consisting of fishes, or oviparous animals, inhabiting the water, breathing by means of permanent branchiæ, and having fins for progressive motion. See *Ichthyology*.

PISCES (in Astronomy). The twelfth and last of the zodiacal constellations, consisting of 113 stars. It denoted the third month, extending from the 20th of August to the 20th of September. During this period, the inundation of the Nile spreads over the whole of Egypt, and the fishes move about.

PISCIS AUSTRALIS. The Southern Fish; a constellation, consisting of twenty-four stars, the principal of which is Fomalhaut.

PISCIS VOLANS. The Flying-fish; a modern southern constellation, consisting of eight stars.

PI'SOLITE (*πίσον*, a pea, *λίθος*, stone). A variety of carbonate of lime, possessing a structure like that of an agglutination of pease. It occurs in the middle Oolite Formation.

PI'STACITE. The name given by Werner to some mineral substances, now more generally designated by the name of *epidote*, a sub-species of prismatoidal augite.

PISTIL (*pistillum*, a pestle). The name given by botanists to the female apparatus in plants. It occupies the centre of the flower, and is distinguished into three parts; viz. the ovary, the style, and the stigma.

PISTON. A short plug of metal, or other solid substance, fitted exactly to the cavity of the barrel or body of a pump. It serves the purpose of exhausting the air from the barrel, and is hence commonly called the *sucker*. There are two kinds of pistons used in pumps, the one with a valve, and the other without a valve, called a *forcer* or *plunger*.

PIT COAL. Common coal; so called from its being obtained by sinking pits in the ground.

PITCH-ORE. The hydrous protoxide of uranium, also called *indivisible uranium;* found in primitive rocks.

PITCHSTONE. A quartzose rock, of a uniform texture, belonging to the unstratified and volcanic classes, which has an unctuous appearance like that of indurated pitch.

PITTA'CAL (*πίττα*, pitch, *καλὸς*, beautiful). A beautiful blue colouring matter, discovered in the oil of tar.

PITTED TISSUE. *Bothrenchyma*. A variety of the cellular tissue of plants, having its sides marked by *pits*, sunk in the substance of the composing membrane. It was formerly designated by the term *dotted ducts*, vasiform tissue, &c.

PI'TTIZITE. Pitchy iron ore; a variety of bog iron ore found near Limoges in France.

PLACE'NTA. In Botany, that part of the ovary from which the ovules arise. It generally occupies the whole or a portion of one angle of each cell. It is sometimes elongated in the form of a little cord, called the *umbilical cord*, as in the hazel.

PLAGIO'STOMI (*πλάγιος*, transverse, *στόμα*, a mouth). An order of cartilaginous Fishes, which have their mouth placed transversely beneath the snout.

PLANE, or PLANE SURFACE. In geometry, this is a surface such that the right line, which joins every two points which can be assumed upon it, lies entirely in the surface. Hence, a *plane rectilineal figure* is any portion of a plane surface which is included by right lines, and the figure is *trilateral, quadrilateral, multilateral,* &c., according as it has three, four, or many sides.

1. *Plane, vertical.* A plane which passes through the zenith, or point which is directly over our heads, and the centre of the earth, is called a *vertical plane,* and the circle in the heavens marked by such a plane, is a *vertical circle,* or azimuth.

2. *Plane, Tangential.* A plane which touches a curvilineal solid. It is from such a plane that *angles of incidence* are measured, whether the impinging rays be *reflected* or *refracted.*

3. *Plane, inclined.* In Statics, this term denotes a plane inclined to the horizon. It is used as a mechanical power, and the problem is to find the force necessary to prevent a body placed upon it from sliding down under the action of its own weight.

4. *Plane of Floatation.* The surface of a heavy fluid at rest is a horizontal plane, and the portion of this plane which we may imagine to be within a floating body, is called the *plane of floatation.*

5. *Plane of Vibration.* It is assumed that in polarized light the particles of ether vibrate only in two opposite directions; the plane in which these excursions take place is called the *plane of vibration;* and, if a plane be conceived to be situated at right angles to the plane of vibration, and in the direction of the ray, this will be its *plane of polarization.*

PLA'NET (πλανήτης, a wanderer). A star which is found to change its relative situation among the other stars. Planets are distinguished, with reference to their centres of revolution, into primary and secondary. *Primary* planets are those which revolve round the sun as a centre; *secondary* planets, more frequently called satellites or moons, are those which revolve round a primary planet as a centre, and are carried with it in its revolution round the sun.

1. The *Primary Planets* are divided into superior and inferior. The *superior* are those more remote from the sun than the earth, as Mars, Jupiter, Saturn, Herschel, and Neptune. The *inferior* are those which are nearer to the sun than the earth, as Mercury and Venus. See *Asteroids.*

2. The following *symbols* are employed to designate the planets in tables and on globes. Mercury ☿, Venus ♀, the Earth ⊕, Mars ♂, Vesta ⚶, Juno ⚵, Ceres ♀, Pallas ⚴, Jupiter ♃, Saturn ♄, Herschel or Uranus ♅.

3. Two planets are in *conjunction* when they have the same longitude; they are in *opposition* when their longitudes differ by 180°.

PLANETARY PERIOD. The period in which a planet comes again into the position which it occupied at first with respect to the sun. The motions of the planets being oscillatory, a planetary period is not that in which a planet revolves round the heavens, but a repetition of such periods. For instance, when Mercury has just repeated the circuit of the earth's visible heaven, he is not in the same position with respect to the sun as at the beginning. The cycle of relative positions is not completed, for this planet, in less than thirteen years and three days, or two days if there be four leap years in the period. So, in a watch, the cycle of relative positions of the minute and the hour hand is not repeated every hour, but in every twelve hours.

PLANIPE'NNES. One of the sections of Insects into which Latreille divides the order Neuroptera. There are four families: viz., the panorpidæ, the myrmeleonidæ, the hemerobiidæ, and the perlidæ.

PLA'NISPHERE. An old term for any representation of the sphere upon a plane. It now denotes any contrivance by which plane surfaces moving on one another fulfil any of the uses of a celestial globe.

PLANTI'GRADA (*planta,* the sole of the foot, *gradior,* to walk). A division of the terrestrial *Carnivorous* animals, which, in walking, apply the entire sole of the foot to the ground, as far back as the end of the os calcis; as the bear, the badger, &c. See *Digitigrada.*

PLASMA. A scarce green semitransparent chalcedony, of a dark tint, supposed to be coloured by chlorite.

PLASTER OF PARIS. Sulphate of lime, or gypsum, heated in an oven till nearly anhydrous, and then reduced to powder. On adding water, an artificial hydrate, or *stucco,* is formed, which sets in a short time, and has the same composition as native gypsum.

PLASTIC CLAY (πλάσσω, to fashion). One of the beds of the Eocene Tertiary Period, named from its being used in the manufacture of pottery. The term is applied to a series of beds, chiefly sands, with which the clay is associated.

It skirts the London clay within the London chalk basin, and appears also in the Isle of Wight.

PLATEAU. A term often exclusively applied to an elevated plain; it is, however, sometimes used to denote a great extent of country considerably raised above the rest of the land, and having its mountains, plains, and valleys; as in the minor plateau of Albania, and the great plateau of Central Asia. See *Table Land*.

PLATFORM. When a mountain appears as if its summit were cut off, leaving a level and horizontal surface, it forms a *platform*, or is said to be truncated. See *Mountain*.

PLA'TINUM (*plata*, silver). A white metal found in the auriferous sand of certain rivers in America. Reduced to a state of extreme division, it has the appearance of sponge; and it is then called *spongy* platinum, and is used as a pyrophorus.

PLECTO'GNATHI (πλεκτὸς, twisted, γνάθος, a jaw). An order of Fishes, in which the bones of the upper jaw are united to each other and to the head.

PLEI'OCENE (πλείων, more, καινὸς, recent). By the terms Older and Newer Pleiocene, are denoted two divisions of the Tertiary Period which are the most modern, and of which the largest part of the fossil shells are of recent species. The newer formation is also termed *pleistocene*.

PLEIOSAU'RUS (πλείων, more, σαῦρα, a lizard). A species of animal, the remains of which are found in some of the clay beds of the oolites; it seems to have been intermediate between the plesiosaurus and the ichthyosaurus; the teeth, vertebræ, bones of the extremities, &c., being more like the corresponding parts of the former, but the animal resembles the latter in the absence of apparent neck; and from this greater analogy with reptiles it has received its name.

PLEI'STOCENE (πλεῖστος, most, καινὸς, recent). The newest of the tertiary strata, which contain the largest proportion of living species of shells.

PLE'ONASTE. *Ceylonite*. An aluminate of protoxide of iron and magnesia.

PLESIOSAU'RUS (πλησίον, near to, σαῦρα, a lizard). An extinct genus of Saurian reptiles, which united to the head of a Lizard the teeth of a Crocodile; a neck of enormous length, resembling the body of a serpent; a trunk and tail having the proportions of an ordinary quadruped, the ribs of a Chameleon, and the paddles of a Whale. They appear to have lived in shallow seas and estuaries, and to have breathed air like the Ichthyosauri and our modern Cetacea.

PLEURE'NCHYMA (πλευρὰ, the side, ἔγχυμα, infusion). A designation of the woody tissue of plants, consisting of very slender, tough, transparent, membranous tubes, tapering acutely to each end, lying in bundles, and communicating with one another by invisible pores.

PLEURONE'CTIDÆ (*pleuronectes*, the flounder; from πλευρὰ, the side, νηκτὴς, a swimmer). The Flat-fish or Flounder tribe; a family of *Malacopterygious* or soft spined fishes, characterized by extreme flattening of the body, and by deficiency of symmetry. The term *pleuronectes*, or side-finned, is calculated to produce an erroneous; opinion what are usually called the belly and back of these fishes being actually the sides, though differing remarkably in colour.

PLEURO'PTERA (πλευρὰ, the side, πτερὸν, a wing). A tribe of quadrupeds, generally known as Flying Lemurs, Flying Cats, and Flying Foxes. They are generally arranged under the order Carnassiers, and are placed by some zoologists in the division Cheiroptera.

PLEUROTOMA'RIÆ. A sub-family of the *Trochidæ*, named from the *pleurotomaria*, a fossil trochiform shell, having a slit in the outer lip.

PLEUROTO'MINÆ. The slit-shells; a sub-family of the *Strombidæ*, or Wing-shells, named from the typical genus *pleurotoma*, and characterized by a deep lobe, or slit, at the top of the outer lip; the spire, in general, is very long and the shells themselves often spindle-shaped.

PLI'CIPENNES (*plica*, a fold, *penna*, a wing). The third section, according to Latreille, of the Neuropterous insects. They constitute the genus *phryganea*, and are known by the name of caddis-worm. They form the order *Trichoptera* in the system of Kirby and Spence.

PLINLIMMON ROCKS. A subordinate group of the Cambrian series, consisting of the greywacké of various qualities; it corresponds with the Greywacké Range of the Lammermuir, extending from St. Abb's Head, on the east coast of Scotland, to the Mull of Galloway.

PLOMB GOMME. Hydrated aluminate of lead, found in the French department of Coté du Nord.

PLOPOCA'RPIUM. A term applied by Desvaux to a form of fruit, consisting of several *follicles* united in a single flower, as in nigella and delphinium.

PLUMBA'GO. Carburet of iron; a mineral, also known as graphite and blacklead, occurring in rounded masses deposited in beds in the primitive formations, particularly in granite, mica-schist, and primitive limestone. Borrowdale in Cumberland is a celebrated locality of graphite, and affords the only specimens which are sufficiently hard for making pencils.

PLUMBER'S SOLDER. An alloy of one part of tin and two of lead.

PLUMBOCA'LCITE. A mineral substance in which the oxide of lead occurs in the form of carbonate of lime; an isomorphism by which the protoxide of lead is connected with the magnesian oxides.

PLUMULE (*plumula*, a little feather). *Gemmule.* The ascending part of the axis of the embryo of a seed.

PLUTO'NIC ACTION. The influence of volcanic heat and other subterranean causes under pressure.

PLUTONIC ROCKS. A designation of granite, porphyry, and other igneous rocks, supposed to have been consolidated from a melted state at a great depth from the surface, and named from Pluto, the fabled God of the infernal regions. The term *unstratified* is also applied to this, the first class of rocks.

PLUVIO'METER (*pluvius*, rain, μέτρον, a measure). A rain-gauge; a vessel for catching falling rain, in order to determine what quantity of rain has fallen in a given period.

PNEUMA'TICS (πνεῦμα, wind). That branch of natural philosophy which treats of the mechanical properties of air and other compressible fluids. The term *pneumatology* was once employed for metaphysics.

PNEUMOBRANCHIA'TA (πνεῦμα, air, βράγχια, gills). Under this term, Lamarck arranges several genera of Molluscous animals into a section, which connects his second order *Hydrobranchia* with his third order *Tracheli-podes.* The genera are onchidium, parmacella, limax, testacellus, and vitrina.

PODE'TIUM (ποὺς, ποδὸς, a foot). A little foot; the stalk-like elongation of the thallus, which supports the fructification of the Cenomyce, a plant of the order of the Lichens.

PODOGY'NIUM (ποὺς, ποδὸς, a foot, γυνὴ, a female). A term applied to the stalk upon which the ovary is seated in certain plants, as the Passiflora, Tacsonia, &c. It is also called *gynophore*, and *thecaphore.*

PODOPHTHA'LMIA (ποὺς, ποδὸς, a foot, ὀφθαλμὸς, the eye). A group of the malacostracous Crustacea, which have moveable pedunculated eyes. It contains two orders; the Decapods and the Stomapods. See *Edriopthalmia.*

PODOSPE'RMIUM (ποὺς, ποδὸς, a foot, σπέρμα, seed). A term applied by some writers to the funiculus or umbilical cord, by which the ovule of plants is connected with the placenta.

PODU'RIDÆ. A family of wingless insects, belonging to the order Thysanoura, in which the extremity is prolonged into a forked tail, as in the *podura.*

PŒCILO'PODA (ποικίλος, various, ποὺς, a foot). A designation of the lowest forms of the *Crustacea*, from the anisopodous character of their segments, the feet of different segments being prehensile, or natatory, or branchial, or ambulatory.

POIKILI'TIC (ποικίλος, variegated). A term sometimes applied, in geology, to the New Red Sandstone formation, owing to the varieties of colours which it presents.

POINT. A *physical point* is the smallest magnitude perceptible by the senses. If such a point be supposed to be infinitely diminished, an idea is formed of a *mathematical point*, of which we may say that it has "no parts." As a *mathematical line* may be conceived to proceed from the motion of a *mathematical point*, so a *physical line* may be conceived to be generated by the motion of a *physical point.*

Point of Contrary Flexure. A point at which a curve changes its curvature with respect to any given external point, being concave on one side and convex on the other.

POINTS OF THE COMPASS. Besides the *cardinal* points, North, South, East, and West, intermediate directions are adopted by seamen and travellers, amounting in all to thirty-two primary directions, each of which is called a *point of the compass*, and thence the interval between them, or the angle from point to point, is also called a *point.*

1. The *first sixteen* of these intermediate points are named as follows:—Half-way between north and east, is North-East (N.E.); and similarly are explained South-east, South-west, and North-West (S.E., S.W., N.W.). Again, half-way between North and North-East is North-North-East (N.N.E.); and thus are explained East-North-East, East-South-East, South-South-East, South-South-West, West-South-West, West-North-West, North-North-West (E.N.E., E.S.E., S.S.E., S.S.W., W.S.W., W.N.W., N.N.W.).

2. These *sixteen are subdivided*, the new and final subdivisions being described each by the simplest of the two adjacent directions, and the cardinal direction in which that last direction is left. Thus, North-East *by* North means the direction next to North-East in going towards the north, and comes between N.E. and N.N.E. By the same rule, North-east by North might be called North-North-East *by* East, but the former is the more simple.

3. The angle of revolution from one point to the next is, of course, the 32nd part of 360°, or 11¼°, and it is sometimes customary to insert fractions of a point; thus N.N.E¼E., means a quarter of a point eastward from N.N.E.

POLAR CIRCLES. Two circles, North and South, *Arctic* and *Antarctic*, described by the earth in its diurnal rotation, and so named from their proximity to the two poles, from which they are at the same distance as the tropics are from the equator, viz. 23½ degrees. These polar circles bound those portions of the earth where it is continuous day and night during several diurnal revolutions of our planet. On the terrestrial globe these circles surround the *frozen zones*.

PO′LARISCOPE. An instrument contrived for the exact and convenient observation of the phenomena of polarized light, and also for the measurement of the angle of polarization.

POLA′RITY. A term applied, in its most comprehensive sense, to a body possessing certain powers which are not general, but local, and not the same, but opposite. It is more particularly applied to the *magnet*, the attractive power of which is not possessed in an equal degree by every particle composing the magnet, but is chiefly localized in two points at or near its extremities; further, the powers residing in these points are not one and the same, but different—indeed contrary in their nature, and are distinguished by the different names of Boreal magnetism and Austral magnetism. These two points are called the *poles* of the magnet, and the right line joining them is the *axis*.

1. *Polarity, Chemical.* The principle just stated has been applied to the chemical phenomena of the voltaic circle. The zinc and hydrochloric acid are equally supposed to have a polarizable molecule: one pole of each molecule has the attraction, or affinity, which is characteristic of zinc, or zincous attraction, and is called the *zincous pole;* while the other has the attraction, or affinity, which is characteristic of chlorine, or chlorous attraction, and is called the *chlorous pole*. Polarity is not an ordinary condition of the particles of either the zinc or the acid; but is developed in both when brought into contact with each other.

2. *Two Polarities.* A term expressive of two antagonist energies, each of which repels that which is similar, and attracts that which is opposite, to itself. Thus, the two north or two south poles of two magnetic needles mutually repel each other; but the north pole of one needle, and the south pole of another, mutually attract each other.

3. *Reversion of Terms.* The earth itself being considered as a magnet, or as containing within itself a powerful magnet, lying in a position nearly coinciding with its axis of rotation, the *south pole* of a magnetic needle would point towards the *north pole* of the earth; so that the *north end* is the *south pole*, and the *south end* the *north pole* of a magnetic needle.

4. *Boreal and Austral Polarities.* To avoid the above confusion of terms, the words Boreal and Austral have been applied to the magnetism of the earth, while the terms North and South have been restricted to that of the needle; what had been called *northern* polarity being now *Austral* polarity; what had been called *southern*, being *Boreal* polarity.

5. *Chemical and Cohesive Polarities.* Two hypothetical forces, supposed by Dr. Prout to reside in the ultimate molecules of matter; the *chemical* being of a binary character, existing between molecule and molecule, and chiefly between molecules of *different* matter; the *cohesive* determining, under certain circumstances, the cohesion of the molecules of the *same* matter.

POLARIZED LIGHT. A ray of light is said to be polarized, when, after its emergence from the substance, or reflection from the surface, of a body, it acquires *poles* or sides with different properties in relation to the plane of its incidence. Polarized light is procured—1. by *reflection* from the surfaces of transparent and of opaque bodies; 2. by *transmission* through several plates of uncrystallized bodies; and, 3. by transmission through bodies regularly crystallized, and possessing the property of double refraction, as Iceland spar.

POLE (πολέω, to turn). The extremity of the axis of a circle. The extremities of the *axis* of the earth are termed the *poles*, and are, respectively, the north and south—the *Arctic* and *Antarctic*—poles of our globe. The earth's axis, being extended each way, becomes an *axis* to the spherical concavity of the sky, and its extremities are the north and south *poles* of the heavens. See *Axis.*

Pole of revolution. When a globe revolves about one of its diameters, each extremity of that diameter is called a *pole of revolution.* Every point of the sphere describes either the great circle which has the poles of revolution for its poles, or one of the parallels of that great circle.

POLE-STAR, or POLAR STAR. A bright star of the second magnitude, in the tip of the tail of the northern constellation *Ursa Minor*, or the Little Bear; it is named from its proximity to the north pole of the heavens, the only one visible in our latitude.

PO'LEMOSCOPE (πόλεμος, war, σκοπέω, to view). An instrument, invented by Hevelius, for viewing objects which cannot be seen by direct vision. It consists of a perspective glass, having a reflector placed at an angle of 45° to its axis, so that any object falling on the reflector is conveyed to the eye. The name suggests that a person might, by means of such an instrument, observe, from a place of concealment, what is going on in an enemy's camp.

POLITICAL ECONOMY. That branch of political science which relates to the production and accumulation of wealth, its distribution and consumption. It is, in short, to the state what private economy is to the single family.

POLLEN. The organic matter by which impregnation is effected in the vegetable kingdom. It consists of fine powder, or *grains*, enclosed within the anther. Each grain, when mature, and brought into contact with the stigmatic tissue, emits a *tube*, containing a fluid termed *fovilla*, which is charged with molecular matter. The *pollen-masses* of Orchidaceous and Asclepiadaceous plants consist of pollen-grains cohering into solid waxy masses.

POLLUX. A star of the second magnitude, in the zodiacal constellation Gemini. The same name is also given to the hindermost twin, or posterior part, of the same constellation.

POLY-, POL- (πολὺς, many). A Greek prefix, denoting *many* or *much*.

1. *Pol-akenium.* A term applied by Richard to a fruit consisting of several akenia (see *Achænium*). When there are two cells, the fruit is a *di-akenium;* when three, a *tri-akenium;* and so on.

2. *Poly-adelphia* (ἀδελφὸς, a brother). The eighteenth class of plants in the Linnæan system, in which the stamens are associated in several parcels, or *brotherhoods*, as in Hypericum.

3. *Poly-andria* (ἀνὴρ, a man). The thirteenth class in the Linnæan system of plants, comprising those which have more than twenty stamens inserted beneath the ovarium.

4. *Poly-basite.* A double sulphuret of silver and other metals, in which the sulphuret of silver and the subsulphuret of copper, being isomorphous, replace each other in indeterminate proportions.

5. *Poly-carpous* (καρπὸς, fruit). A term applied to a plant which has the power of bearing fruit many times without perishing. Poly-carpous plants are distinguished into the *caulocarpous*, or those whose stem endures many years, constantly bearing flowers and fruits, as trees and shrubs; and the *rhizocarpous*, or those whose root endures many years, but whose stems perish annually, as herbaceous plants.

6. *Poly-chorion* (χόριον, any skin). A term applied by Mirbel to the fruit of the ranunculus, &c., more commonly known by the term *etærio.*

7. *Poly-chroite* (χρόα, colour). The extractive matter of saffron, the watery infusion of which assumes different colours when treated with different agents.

8. *Poly-clinum* (κλίνη, a bed). A general term applied by Cuvier to all those forms of aggregated *tunicated* mollusca, which agree more or less closely, in internal structure, with the salpæ and ascidians.

9. *Poly-galaceæ.* The Milkwort tribe of dicotyledonous plants. Shrubs or herbaceous plants with *leaves* generally alternate; *flowers* polypetalous, unsymmetrical; *stamens* hypogynous; *ovary* 2-celled; *fruit* dehiscent.

10. *Poly-gamia* (γάμος, nuptials). The name of the twenty-third class in the Linnæan system of plants, comprising those which bear hermaphrodite and unisexual flowers on the same individual; or hermaphrodites on one individual, males on a second, and females on a third.

11. *Poly-gastrica* (γαστὴρ, a stomach). A class of Radiated animals, having numerous stomachs or cœca communicating with an internal alimentary cavity, without perceptible nerves or muscles, but moving by means of external vibratile cilia.

12. *Poly-gon* (γωνία, an angle). A rectilinear figure, bounded by more than four sides. Polygons are called pentagons, hexagons, heptagons, &c., according as they are bounded by five, six, seven, or more sides. A line joining the vertices of any two angles which are not adjacent is called a *diagonal of the polygon.*

13. *Poly-gon of Forces.* A theorem in mechanics, which may be thus stated:—If any number of forces act upon a point, and a polygon be taken, one of the sides of which is formed by the line representing one of the forces, and the following sides in succession by lines representing the other forces in magnitude, and parallel to their directions, then the line which completes the polygon will represent the resultant of all the forces.

14. *Poly-gonal* (γωνία, an angle). A term applied, in arithmetic, to certain numbers possessing this property, that the same number of points may be arranged in the form of that polygonal figure to which they belong. See *Figurate Number*, and *Number*.

15. *Poly-gonaceæ.* The Buck-wheat tribe of dicotyledonous plants, herbaceous plants with *leaves* alternate; *flowers* occasionally unisexual; *stamens* definite; *ovary* superior; *seed* with farinaceous albumen.

16. *Poly-gynia* (γυνὴ, a woman). The designation of those *orders* of plants in the Linnæan system, in which there is an indefinite number of stamens.

17. *Poly-halite* (ἅλς, salt). A chemical compound of several sulphates, formerly mistaken for anhydrous sulphate of lime; compact and fibrous, from the salt formation in Bavaria and Austria.

18. *Poly-hedron* (ἕδρα, a seat or side). A geometrical solid bounded by several faces or planes. In every solid polyhedron, the number of faces and corners exceeds the number of edges by *two.*

19. *Poly-meric* (μέρος, a part). A term applied in chemistry to those bodies which contain the same relative, but not the same absolute number of atoms of the same elements, and whose atomic weights are consequently unlike. Several carburets of hydrogen afford examples of polymerism. See *Isomerism.*

20. *Poly-mignite.* Titaniate of iron; a new mineral found sometimes in the zircon-syenite of Fredrickswärn in Norway.

21. *Poly-nomial.* A barbarous word, sometimes employed in algebra for *multinomial*, and denoting a quantity of many terms, as the expression

$$a + 2\,b + 3\,c + nd, \text{ \&c.}$$

22. *Poly-optron* (ὄπτρον, a looking-glass). A glass for multiplying objects. It consists of a lens one side of which is plane, but the other presents several spherical concavities, each of which becomes a plano-concave lens, and diminishes the object viewed.

23. *Poly-petalous* (πέταλον, a flower-leaf). A designation of that kind of corolla, in which the petals are separate from one another, as distinguished from the monopetalous or gamopetalous corolla, in which the petals cohere.

24. *Poly-phore* (φέρω, to bear). The name given by Richard to the succulent and dilated receptacle of such plants as the strawberry and the raspberry. More commonly, such a receptacle is sufficiently described by the adjective *fleshy.*

25. *Poly-piaria. Corals.* A numerous class of invertebrated animals, belonging to the great division of the Radiata.

26. *Poly-piphera.* A class of the Radiata, consisting of soft, aquatic animals of a plant-like form, which develope small tubular digestive sacs called *polypi*, the margins of which are furnished with sensitive tentacula, and the sides of the latter with vibratile cilia.

27. *Poly-podiaceæ.* One of the principal divisions of the natural order of Ferns, constituting the highest form of acrogenous plants, and exhibiting the nearest approach to the Cycadaceous Gymnosperms.

28. *Poly pus* (ποὺς, ποδὸς, a foot). Under the common name *Polypi* have been

grouped together three classes of Radiated animals, on account of their external resemblance to the many-armed cuttle-fishes, which were so denominated by the ancient Greek naturalists. The term now denotes a class of Radiated animals, furnished with numerous prehensile organs radiating from around the mouth.

29. *Poly-scope* (*σκοπέω*, to view). A lens plane on one side, and convex on the other, the latter being formed of several plane surfaces, or *facettes*, for the purpose of multiplying any object.

30. *Poly-sepalous.* A designation of that form of calyx, in which the sepals are separate from one another, as distinguished from the monosepalous or gamosepalous calyx, in which the sepals cohere.

31. *Poly-spermous* (*σπέρμα*, seed). Having many seeds; a botanical term applied to certain fruits, which contain many seeds, and distinguished from *oligo-spermous*, or few-seeded.

32. *Poly-synthetic* (*σύνθεσις*, a putting together). The name applied by Du Ponceau to the class of languages spoken by the Indian tribes of America, from the manner in which words are abbreviated and combined to express ideas.

33. *Poly-thalamaceans* (*θάλαμος*, a chamber). The name given by De Blainville to an order of Cephalopods, including all those which inhabit many-chambered shells.

34. *Poly-zonal* (*ζώνη*, a belt). Literally, what is composed of many *zones*, or belts. The term is applied to certain lenses, composed of pieces united in rings, which are therefore called *poly-zonal lenses.*

POMA'CEÆ (*pomum*, an apple). The Apple tribe of dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* polypetalous; *stamens* perigynous; *fruit* 1 to 5-celled.

POME (*pomum*, an apple). A fruit consisting of two or more inferior carpels united together, the pericarp being fleshy, and formed of the floral envelope and the ovary closely adhering.

PO'NDERABLE MATTER (*pondus*, weight). A term applied to all bodies possessing weight, as metals, gases, &c., as distinguished from light, heat, and electricity, which, having no appreciable weight, are termed *imponderable* agents.

PORCELAIN CLAY. A species of clay with various shades of white, consisting, according to Wedgwood, of 60 parts alumina and 40 silica. It probably originated in the decomposition of felspar.

PORCELAIN JASPER. A variety of jasper, produced by the action of subterraneous fire on clay slate.

PORI'FERA (*porus*, a pore, *fero*, to bear). A class of the Radiata, consisting of soft, gelatinous animals, which have their body traversed internally by numerous anastomozing canals, commencing from superficial minute *pores*, and terminating in large open vents.

PO'RISM (*πόρισμα*, a corollary). Something deduced from a previous demonstration. In the original Greek of Euclid's Elements, the corollaries to the propositions are called *porisms;* but this scarcely explains the nature of porisms, as it is manifest that they are different from simple deductions from the demonstrations of propositions. Prof. Playfair defines a porism to be "A proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate or capable of innumerable solutions." This definition represents a porism as almost the same as an indeterminate problem. Every indeterminate problem containing a locus may be made to assume the form of a *porism*, but not the converse. Porisms are of a more general nature than indeterminate problems which involve a locus.

PORO'SITY. That property of matter, in consequence of which it does not completely fill the space which bodies occupy; and this is owing to the presence of *pores*, or interstices, which occur among the particles of bodies, even the densest. The *mass* and *density* of bodies are estimated according to their various degrees of porosity: the greater the mass, the less porous will be the substance; and, of two bodies, that is the more dense, which with equal bulk contains the greater mass.

POR'PHYRY (*πορφύρα*, purple). An unstratified or igneous rock. This term was applied, in the time of Pliny, to a red rock, with small, angular, white bodies, diffused through it, which are crystallized felspar, brought from Egypt; and hence it has been applied to every species of unstratified rock in which detached crystals of felspar, or other mineral, are diffused through a base of other mineral composition. Thus, claystone with crystals of felspar, is called claystone porphyry.

PORTLAND LIMESTONE. *Port-*

land Beds. A series of limestone strata, belonging to the upper part of the Oolite group, found chiefly in England, in the island of Portland, on the coast of Dorsetshire. The great supply of the building stone used in London is from these quarries. *Portland Sand* is an intermixture of siliceous and calcareous sand, containing green particles. *Portland Oolite* is a calcareo-siliceous, more or less oolitic freestone, of a yellowish-white colour, containing nodules of flint in its upper part.

PORTU'NIDÆ. Paddling Crabs; a family of the brachyurous crustaceans, nearly allied to the Cancerians.

POSITION. An arithmetical rule, also called the rule of Supposition, the *Rule of False*, or the *Rule of Trial and Error*. It consists in assuming numbers, and operating upon them, in order to discover the true number. *Single Position* relates to those questions in which the results are proportional to the suppositions, and in which, consequently, one assumption only is required. *Double Position* embraces questions in which the results are not proportional to the suppositions, and in which two assumptions are necessary in order to find the true answer.

POSITIVE QUANTITY. In Algebra, this term denotes an affirmative or additive quantity. Its symbol, +, which is read *plus*, signifies that the quantity to which it is prefixed, must be added; and, if no symbol is prefixed, the quantity is still understood to be positive.

POSITIVE TERMS. In Logic, those terms which denote a certain view of an object as being actually taken of it, are called *positive*. They are thus distinguished from *privative* terms, which denote that this view *might* be taken of an object, but *is* not; and from *negative* terms, which denote that such a view is not and *could* not be formed of the object. "A *living* man" is an illustration of the first kind of terms; "a *lifeless* man," of the second; "a *lifeless carcase*," of the third.

POSSIBLE. This word, like the others of kindred meaning, relates sometimes to *contingency*, sometimes to *power;* and these two senses are frequently confounded. In the former sense, we say, "it is possible this patient may recover," not meaning, that it depends on his choice, but that we are not sure whether the event will not be such. In the latter sense it is "possible" to the best man to violate every rule of morality; since if it were out of his *power* to act so if he chose it, there would be no moral goodness in the case; though we are quite sure that such will never be his choice (*Whately*). See *Impossibility.*

POSTERIOR MARGIN. A term applied to that side of the bosses of acephalous bivalves, which contains the ligament.

PO'STULATE (*postulatum*, a thing demanded). A thing required to be *granted*, for the purpose of reasoning. The object of the postulates in Euclid is to declare that the only instruments, the use of which is permitted in Geometry, are the *rule* and the *compass.*

POTASH. *Potassa.* The hydrated protoxide of potassium, procured by the incineration of vegetables, and named from the circumstance that the water in which the ashes are washed is evaporated in iron pots.

POTA'SSIUM. *Kalium.* A metallic substance, white, with a brilliant lustre, like mercury, hard and brittle at 32°, soft and malleable at 50°, fluid at 150°, and volatilized below a red heat.

POTENTIAL MOOD. This mood, according to the views of Crombie and Greenlaw, is strictly *subjunctive*, and in all those cases in which its signification is potential, it is by ellipsis, and not by its own proper power of expression.

POT-METAL. A mixture of copper and about a fourth its weight of lead.

POTSTONE. *Lapis Ollaris.* A greenish-grey mineral, occurring in thick beds in primitive slate, and fashioned into culinary vessels in Greenland. It is a sub-species of the rhomboidal mica of Jameson.

POTTER'S CLAY. A variety of clay of various colours, disintegrating on exposure to the air; when mixed with sand, it is made into bricks and tiles, and is also used for coarse pottery.

POWER. In Mechanics, this term denotes any force, animate or inanimate, which, being applied to a machine, tends to produce or to prevent motion; in the former case, it is termed a *moving* power or force; in the latter, a *sustaining* power or force. Power is latent force.

POWER OF NUMBERS. In Algebra and Arithmetic, any given number is said to be in its *first* power; multiplied by itself, it becomes the *square*, or *second* power; this, again, multiplied by the original number, becomes the *cube*, or *third* power; and, by continuing the multiplications by the same original number, we obtain the *fourth*, the *fifth*, the *sixth*, &c. powers. Thus taking the number 2,—

$2^1 = 2$, or 1st power;
2×2, or $2^2 = 4$, or 2nd power;
$2^2 \times 2$, or $2^3 = 8$, or 3rd power;
$2^3 \times 2$, or $2^4 = 16$, or 4th power;
$2^4 \times 2$, or $2^5 = 32$, or 5th power;

1. When it is said that 1 is the square of 1, there is a logical error in the use of the terms: it ought to be thus—

1 square is the square of 1 linear; thus

$$1\,\square \text{ is the square of } \underline{1}.$$

2. The numbers indicating the powers, are called the *exponents* or *indices;* and it is evident that powers of the same quantity are *multiplied* by *adding* their exponents, and *divided* by *subtracting* their exponents.

3. With this subject is connected the term *dimension*. Thus, a^1, a^2, a^3, &c. are said to be of one, two, three, &c. *dimensions*, respectively; and, in general, any product is said to be of *n dimensions*, if the sum of the *indices* of its several *literal factors* is equal to n. Thus ab, that is, a^1b^1 is of two dimensions; $3\,a^2b^3$ is of five dimensions; and so on.

4. A *power* in the denominator of a fraction is also expressed by placing it in the numerator, and prefixing the negative sign to its index; thus

$$a^{-1},\ a^{-2},\ a^{-3},\ a^{-n},$$

signify $\frac{1}{a^1}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^n}$, respectively.

These are called the *negative powers* of a.

PRACTICE. An arithmetical rule, deriving its name from its wide *practical* application, and teaching how to find the value of any number of articles, having given the value of one; or to find the value of any quantity, having given the value of a single unit.

PRÆFLORA'TION (*præ*, before, *floreo*, to flower). *Æstivation*. A term in Botany, denoting the manner in which the floral envelopes of plants are arranged previously to their expansion.

PRASE (*πράσον*, a leek). A mineral substance of a leek-green colour, consisting apparently of an intimate mixture of common quartz and actonite, and found in the island of Bute and in Borrowdale.

PRECESSION OF EQUINOXES. The term applied to the slow but regular *retrogradation* of the equinox along the ecliptic, from east to west, or in the *contrary* direction to that in which the sun appears to move in that circle. Thus, the place of the equinox among the stars, at every subsequent moment, *precedes* (with reference to the diurnal motion) that which was held the moment before. The amount of annual retrogradation is only 50″·10, or about a degree in seventy-two years. The period in which the equinox would perform a complete tour of the ecliptic, is 25,868 years.

PRECIPI'TATE (*præceps*, headlong). A solid substance *precipitated*, or thrown down from a solution, by adding a reagent. Thus we have the *red* precipitate or the peroxide of mercury; the *white* precipitate, or the ammoniated chloride; the precipitate *per se*, or the *purple*, &c.

PRECIPITA'TION (*præceps*, headlong). The process of *throwing down* solids from solutions in which they are contained. The substance so separated is called a *precipitate;* and the substance employed to produce this effect, a *precipitant*. This process is the opposite to that of chemical solution.

PRE'DICABLE. In Logic, a term which can be affirmatively predicated of several others. Predicables are also called *common* terms, from their belonging each to several others *all alike*.

PRE'DICAMENT. The predicaments or categories of logicians are certain general heads, or *summa genera*, under which all abstract ideas, and their signs, common words, may be arranged. The classification of predicaments will be found under the term *Categories;* it was introduced by Archytas, and adopted by Aristotle.

PRE'DICATE. The predicate of a proposition is that term which is affirmed or denied of the other. Logically, the predicate occupies the last place in a proposition, though, not unfrequently, it is placed first.

PREHNITE. A zeolitic substance, the grass-green variety of which, found in South Africa, has been mistaken for chrysolite, chrysoprase, and even emerald. The variety which occurs in small thin crystals is called *koupholite*.

PREMISS. In Logic, a proposition employed to establish a certain conclusion. The *major* premiss is that in which the major term is compared with the middle; the *minor* premiss, that in which the minor term is compared with the middle. The two premises of a syllogism are sometimes called together the *antecedent*.

PREPOSI'TION (*præpositus*, placed before). A word which connects two words together, in such a manner as to indicate the relation which the things or ideas signified by them bear to each other. The name of this part of speech has been derived from the accidental circumstance of its being placed immediately *before* the object related to the other thing named; but the essence of the preposition is, to signify *relative position*. "Every preposition," says Adam Smith, "denotes some relation considered in concrete with the correlative object."

PRESSURE. The application of force to a resisting body, when that force is in continued contact with the body on which it is exerted. The *centre of pressure* is that point at which the whole amount of pressure may be applied with the same effect as it has when distributed.

PRIMARY. A term applied, in the astronomical division of the sphere, to the great circle traced upon its surface, half way between the poles. All the smaller circles, which intervene between the primary and the poles, are called *parallels*.

PRIMARY LIMESTONE. A modification of limestone, with a crystalline texture, occurring under many different aspects, and in every member of the series, so that no particular position can be ascribed to it. Its colours are various.

PRIMARY ROCKS. The lowest series of the *stratified* rocks, characterized by a crystalline texture, and by the absence of organic remains. This term has no reference to priority of formation, but expresses the order of their occurrence, they being the *first* after granite. These rocks were termed by Mr. Lyell *metamorphic*, from the supposition that they were deposited in a sedimentary form, and were afterwards altered by the action of heat.

PRIME NUMBER. Any number which cannot be *separated into factors*, 3, 5, as 7, 11, 13, 17, &c., is called a *prime* number. Every number which can be so separated, as 6, 8, 9, 12, &c., is called a *composite* number. When two numbers have no common measure but unity, they are said to be *prime* to each other: thus 3 is prime to 7; 13 to 31; and so on. A *prime number* is one which is prime to every other number.

PRIMINE (*primus*, first). The first or outermost sac of the ovule in plants.

PRIMITIVE WORDS. In grammar, these are words not derived from any other word in the language, as *school*. See *Derivative Words*.

PRIMULA'CEÆ. The Primrose tribe of dicotyledonous plants, peculiarly distinguished by the stamens being opposite to the lobes of the gamopetalous corolla, and by having a superior capsule with a free central placenta.

PRIMUM MOBILE. A term given by the old astronomers to an imaginary sphere, by the motion of which diurnal motion was given to the heavens.

PRINCE'S METAL. *Prince Rupert's Metal.* A species of copper alloy, in which the proportion of zinc is greater than in brass.

PRISM (πρίσμα, from πρίω, to saw). A prism is defined, in Geometry, to be a solid figure contained by plane figures, of which two that are opposite are equal, similar, and parallel to one another, and the others parallelograms. The name is derived from the property exhibited by the glass prism of *separating* a ray of light into its constituent parts.

Prism, Achromatic. A prism through which objects are viewed refracted indeed, so that they are not seen in their true position, but yet free from a prismatic fringe about their edges. It consists of two prisms fitted together, the one being of flint, the other of crown-glass. The vertical angle of the flint-glass prism must be less than that of the crown-glass, and their sizes must be inversely as their dispersive powers. In English flint-glass the vertical angle of the flint-glass prism must be $\frac{2}{3}$ that of the crown-glass, but in Fraunhofer's it must be $\frac{1}{2}$ the size.

PRISMATIC CRYSTALS. The *square prism* differs from the cube only in having its lateral edges either longer or shorter than the terminal. The *right rhombic prism* is a right prism whose base is a rhomb. The *oblique rhombic prism* differs from the preceding in being oblique in the direction of one of the diagonals of the base. All other prismatic crystals, which do not possess any of the degrees of symmetry which characterize the other prisms, are comprehended in the class of *doubly oblique prisms*. In all the varieties of prisms, the crystals are supposed to rest on one of the bases or *terminal planes* of the prism, the surfaces which bound the prism lengthwise being called *lateral planes.* The edges at which these meet are *lateral edges;* and the edges at which they meet the terminal planes are *terminal edges.*

PRISMATIC SPECTRUM. *Solar Spectrum.* The variously-coloured appearance presented by a ray of light, when separated into its constituent parts by refraction through a glass prism. The appearance consists of an oblong image, containing seven colours, which are *simple* or homogeneous, as distinguished from the white ray, which is *compound* or heterogeneous.

PRISME'NCHYMA (*πρίσμα*, a prism, *ἔγχυμα*, infusion). The name given by Morren to the prismatical variety of the parenchyma of plants.

PRIVATIVE TERMS. In Logic, terms which denote that a certain view *might* be taken of an object, though it is not so taken, are called *privative.* Thus, in the expression, "the moon is sometimes invisible," the word *invisible* is used privatively, for the moon is capable of *being seen.* See *Negative Term.*

PROBABILITIES or CHANCES. The popular use of these terms has no very distinct meaning. The mathematical meaning points out a *real value* existing in the circumstances. A question of probability is termed *direct*, when, certain causes being given as existent, from which a certain event may proceed, the probability of that event happening is required. A question of probability is termed *inverse*, when, an event being given as existent, and proceeding from one of several causes, the probability of one proposed cause being the true one is required.

PROBLEM (*πρόβλημα*, any thing proposed as a task). A proposition in which something is proposed to be done; as a line to be drawn under some given conditions, some figure to be constructed, &c. The *solution* of the problem consists in showing how the thing required may be done by the aid of the rule and the compass. The *demonstration* consists in proving that the process indicated in the solution really attains the required end. A postulate is a problem, the solution of which is assumed.

PROBOSCI'DEA. A group of pachydermatous animals, containing only the elephant and its extinct congeners, the mammoth and the mastodon, characterized by their elongated nose, or *proboscis.*

PROCYON, or α CANIS MINOR. A star of the first magnitude in the constellation Canis Minor.

PRODUCT. In arithmetic, a *product* is the result of the *multiplication* of two or more quantities. The result of the *addition* of two or more quantities is called the *sum.*

PRODUCTA. An extinct genus of fossil bivalve shells, occurring only in the older secondary rocks. It is closely allied to the living genus Terebratula.

PROGRESSION (*progredior*, to advance). This term, in its general sense, means *going forward;* but its use in algebra and arithmetic denotes that the progress takes place in a determinate order—that it is motion measured by some scale.

1. *Progression, Arithmetical.* Quantities are said to be in arithmetical progression, when they increase or decrease by a common *difference.* Thus, 1, 3, 5, 7, &c., 8, 4, 0, —4, &c.; a, $a+d$, $a+2d$, $a+3d$, &c., are in arithmetical progression, the common differences being 2, —4, and d, respectively.

2. *Progression, Geometrical.* Quantities are said to be in geometrical progression, when they increase or decrease by a common *factor;* in other words, when the ratio of any two successive terms is the same. Thus, 1, 3, 9, 27, &c., 16, 4, 1, $\frac{1}{4}$, &c., $\frac{1}{3}$, $-\frac{4}{15}$, $-\frac{16}{75}$, $-\frac{64}{375}$, &c., a, ar, ar^2, ar^3, &c., are in geometrical progression, the common factors, or *ratios* (as they are called), being 3, $\frac{1}{4}$, $-\frac{4}{5}$, and r, respectively.

3. *Progression, Harmonical.* Quantities are said to be in harmonical progression, when their reciprocals are in arithmetical progression; in other words, when any three successive terms are so related, that the first is to the third as the difference between the first and the second is to the difference between the second and the third. Thus, since, 1, 3, 5, 7, &c., $\frac{1}{4}$, $-\frac{1}{4}$, $-\frac{3}{4}$, $-\frac{5}{4}$, are in arithmetical progression, their reciprocals, 1, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{7}$, &c., 4, —4, $-\frac{4}{3}$, $-\frac{4}{5}$, &c., are in harmonical progression. Again, if a, b, c, are in harmonical progression,

$$a : c :: a-b : b-c.$$

PROJE'CTILE (*projicio*, to cast forward). A heavy body which has been projected in a direction not vertical. The *theory of projectiles* investigates the relations between the space described, the time of motion, and the velocity acquired by a body when impelled by some motive force.

PROJE'CTION. The representation

of the surface of a sphere on a plane, according to the laws of perspective. In projecting a spherical surface on a plane, some parts must be unduly contracted or enlarged in proportion to others. The projections chiefly used in maps are the orthographic, the stereographic, and Mercator's.

1. In the *Orthographic* projection, every point of the hemisphere is referred to its diametral plane or base, by a perpendicular let fall on it; so that the representation of the hemisphere thus mapped on its base, is such as it would appear to an eye placed at an infinite distance from it. In this projection, only the central portions are represented of their true forms, while all the exterior is more and more distorted and crowded together as we approach the edges of the map. Owing to this cause, the orthographic projection, though very good for small portions of the globe, is of little service for large portions.

2. The *Stereographic* projection is in great measure free from this defect. The eye is supposed to be placed at the surface of the sphere, and to view the concave of the opposite hemisphere through the plane of that circle, in the pole of which the eye is placed. Hence, the position on this plane of any point of the spherical surface will be indicated by a line drawn from that point through the plane to the eye. This is a true perspective representation: all circles on the sphere are represented by circles in the projection; every very small triangle on the sphere is represented by a *similar* triangle in the projection. This and the preceding mode of projection may be considered *natural*, inasmuch as they are really perspective representations of the surface on a plane.

3. *Mercator's* projection is entirely *artificial*, representing the sphere as it cannot be seen from any one point, but as it might be seen by an eye carried successively over every part of it. In it, the degrees of *latitude*, and those of *longitude*, bear always to each other their due proportion; the equator is conceived to be extended out into a straight line, and the meridians are straight lines at right angles to it. Like the stereographic projection, it gives a true representation, as to *form*, of every particular small part, but varies greatly in point of *scale* in its different regions; the polar portions in particular being extravagantly enlarged, and the whole map, even of a single hemisphere, not being comprisable within any finite limits.

4. In the *Gnomonic* or *Central* projection, the eye is supposed to be placed in the centre of the sphere, and the various objects to be delineated are transferred from the sphere to a plane, which is a tangent to its surface. The entire hemisphere can never be represented by this projection, since the circumference which terminates it is on a level with the eye, and is therefore parallel to the plane of projection. In this case, the parallels of latitude will be concentric circles, and the meridians straight lines radiating from the centre. This method is chiefly employed in dialling, and derives its name from the connexion between the methods of describing it and those for the construction of a gnomon or dial.

5. *Projection by Development.* By this expression is understood the unfolding or spreading out of the spherical surface on a plane. As a preparatory step, however, the sphere must be converted into a *cone* or a *cylinder*, inasmuch as portions of these forms most resemble portions of a sphere, and the forms themselves are susceptible of the required development.

PROLEGS. The wart-like tubercles which represent legs on the hinder segment of caterpillars.

PROLI'FEROUS (*proles*, offspring, *fero*, to bear). A term applied in botany to a flower which produces another flower from its centre, as in certain roses.

PROMERO'PIDÆ. The Hoopoes; a family of the Insessores, or Perching birds, one species of which, the *upupa epops*, occasionally visits Europe. See *Tenuirostres*.

PROOF AND INFERENCE. In addition to what has been adduced under the article, *Inference* and *Proof*, the learned author of the "Elements of Logic" observes, that *proving* may be defined "the assigning of a reason or argument for the support of a *given* proposition;" and *Inferring*, "the deduction of a conclusion from *given* premises." In the one case our *conclusion* is *given*, and we have to *seek* for *arguments;* in the other, our premises are *given*, and we have to *seek* for a conclusion. He adds, that "proving" may be compared to the act of *putting away* any article into the proper receptacle of goods of that description; "inferring," to that of *bringing out* the article when needed.

PROPA'GO; PROPA'GULUM. The

former of these terms was applied by the older botanists to the branch laid down in the process of *layering*. The latter denotes an *offset* in certain plants.

PROPERTIES OF BODIES. The physical properties are divided into the *essential*, or principal; viz. extension and impenetrability, which are common to all bodies, and indispensable to their existence; and the *non-essential*, or accessory, as compressibility, expansibility, porosity, divisibility, elasticity, and gravity.

PROPERTY. In Logic, this term denotes a predicable which expresses something *essentially* conjoined to the essence of the species. It is thus distinguished from the logical *accident*, which denotes something *contingently* joined to the essence. Thus, redness is a *property* of blood, but an *accident* of a house.

PROPO'RTION. This term denotes the *portions*, or parts, of one magnitude which are contained in another. In the language of Mathematics, the term has been appropriated to express *the equality of ratios;* or, as it may be less minutely explained, the case in which one magnitude is as many times greater or less than another, as a third magnitude is greater or less than a fourth. See *Ratio*.

PROPOSI'TION (*propono*, to propose). A short discourse, in which a geometrical truth is stated and considered; it being thereby proposed either to demonstrate something which is asserted, in which case the proposition is called a *theorem;* or to show the manner of doing something which is required to be done, in which case the proposition is called a *problem*.

A *logical proposition* is "a sentence indicative;" in other words, a sentence which affirms or denies. A proposition is distinguished, with reference to its substance, as *categorical*, when it expresses any thing absolutely, as "Cæsar deserved death;" *hypothetical*, when it expresses any thing under a hypothesis, as, "If Cæsar was a tyrant, he deserved death." *Categorical propositions* are termed *pure*, when they assert simply or purely, that the subject does or does not agree with the predicate; and *modal*, when they denote in what *mode* or manner it agrees. Thus, "Brutus killed Cæsar," is a pure categorical proposition; while, "Brutus killed Cæsar *justly*," is modal.

PROSE'NCHYMA. A term applied by Link to that form of parenchyma in plants, in which the cells taper to each end, and overlap each other; the term *parenchyma* being restricted to that form of the tissue, in which the cells have truncated extremities.

PROTEIN (πρωτεύω, to hold the first place). The name given by Mulder to the precipitate obtained by adding acetic acid to a solution of caustic potash, containing fibrin, albumen or gelatine, animal or vegetable, in solution.

PRO'TEOLITE. Under this term and that of *Cornubianite*, Dr. Boase describes the rock in contact with granite, which has been called argillaceous schist, or clay-slate, greywacké, or killas. The proteolite is of a lighter colour than the cornubianite, soft, arenaceous, and slaty. They appear to be chiefly composed of compact felspar, with quartz, mica, and schorl, and contain beds of that substance and of quartz.

PROTHO'RAX. The first of the three segments which constitute the thorax in insects.

PROTO- (πρῶτος, the first). This prefix denotes, in Chemistry, the *lowest* degree in which one body unites with another, as *prot*-oxide. *Per* denotes the *highest* degree, as *per*-oxide.

PRO'TOGENE. *Talcose Granite*. A mixture of felspar, quartz, and talc or chlorite. It occurs abundantly in the Alps of Savoy, and is found in Cornwall, where, on decomposition, it yields the china-clay or porcelain-earth, which is annually exported in large quantities.

PROTOZO'A (πρῶτον, first, ζῶον, an animal). A designation of one of the primary divisions of the Animal Kingdom, from their constituting the first step of animal organization. They correspond with the *Acrita* of Macleay, with the Cryptoneura of Rudolphi, and with the Oozoa of other witers.

PROTOZO'IC SYSTEM (πρῶτον, first, ζῶον, an animal). A geological term, applied to the lowest system of rocks in which the traces of any organic structure have been discovered. It is the system next in ascending order to the *hypozoic*.

PROXIMATE PRINCIPLE. A term applied, in analyzing any body, to the principle which is *nearest* to the natural constitution of the body, and more immediately the object of sense, as distinguished from intermediate or ultimate principles. *Ultimate principles* are the elements of which proximate principles are composed.

PRO'XIMUM GENUS. In Logic, the nearest or least remote genus to which a species can be referred. See *Genus*.

PRUSSIAN BLUE. *Berlin Blue*. The sesqui-ferrocyanide of iron; a beautiful deep blue powder, used in the arts.

PRUSSIAS. A prussiate; a name now exploded, except in commerce, when it denotes a cyanide: what is termed the *yellow prussiate* of potash, is a ferrocyanide of potassium.

PRUSSIC ACID. A designation of *hydrocyanic acid*, from its being an ingredient in Prussian blue.

PRYING and LIFTING. In the common use of a lever of the first kind, the force is gained by bearing down the long arm of the lever, which is called *prying*. In the second kind the force is gained by carrying the long arm in a contrary direction, or upward, and this is called *lifting*.

PSEUDO-BULB. A term applied to the enlarged aërial stem of orchidaceous plants. It resembles a tuber.

PSEU'DO-LITE. A mineral having a close affinity to the pseudomorphous crystals of steatite.

PSEUDOMALACHITE. Prismatic phosphate of copper, from Rheinbreitenbach, where it occurs with quartz which sometimes passes into chalcedony.

PSEUDO-MORPHOUS (ψευδὴς, false, μορφὴ, form). A term applied to substances which, not possessing a crystalline structure, are found in the form of regular crystals. These accidental formations must be considered as merely casts of the crystals they represent.

PSEUDO-STRATA. A term proposed by Macculloch for those extended plates of rocks, not divided into parallel laminæ, and commonly called *table-layers*. Some geologists make a distinction between a *stratum* and a *bed*, meaning by the latter what is called by Macculloch a pseudo-stratum.

PSEUDO-ZOA'RIA. A term proposed by Blainville to include vegetables, many of which have been ranked with the Polypiaria. They are subdivided into two classes, viz. *Calciphyta*, principally composed of the genus Corallina, and *Nematophyta*, including byssus, conferva, oscillatoria, &c.

PSILOMELANE. An ore of manganese containing a considerable quantity of barytes, occurring in Devonshire, Cornwall, in the Hartz, and most manganese mines.

PSITTA'CIDÆ (*psittacus*, the parrot). The Parrot tribe; a family of birds, generally referred to the *Scansores*, or Climbers, with which, however, they correspond in little else than the structure of the foot, and this is adapted rather for grasping than for climbing.

PSY'CHICAL (ψυχικὸς, pertaining to the psyché, or soul). Relating to the phenomena of the soul, and to analogous phenomena in the lower animals. *Psychology*, literally, the doctrine of the soul, denotes a description of the intellectual and moral faculties.

PSYCHRO'METER (ψυχρὸς, cold, μέτρον, a measure). An instrument for measuring degrees of cold. Its action is the same as that of the hygrometer, and depends on the combination of heat which accompanies the evaporation of a fluid, and the consequent deposition of the vapour contained in the atmosphere.

PTERODA'CTYL (πτερὸν, a wing, δάκτυλος, a finger). Wing-fingered; the name of an extinct genus of flying reptiles, species of which have been found in the Oolite and Muschelkalk. Some of the finger joints are lengthened, so as to serve as the expansors of a membranous wing.

PTEROPI'NÆ. The single family of the frugivorous or omnivorous Cheiroptera, of which the *pteropus Javanicus* may be considered the type. They abound in warm climates, and include some of the largest species of the order.

PTERO'PODA (πτερὸν, a wing, ποὺς, a foot). The tenth class of the Mollusca, consisting of small, soft, floating, marine animals, which swim by the contractions of two lateral musculo-cutaneous fins, but are unable to fix themselves or creep in the sea, from the want of feet, as the clio, cleodora, &c.

PTERY'GIANS (πτέρυξ, a wing). A name given by Latreille to a group of the Mollusca, corresponding to the cephalopods and pteropods of Cuvier, both of which have locomotive organs, consisting of wing-like expansions of the skin.

PTOLEMA'IC SYSTEM. A system of astronomy so named from the famous geographer Claudius Ptolemæus, who flourished in Egypt during the reigns of the Roman emperors Hadrian and Antoninus Pius. He taught *that the earth was at rest in the centre of the universe, and that the heavens revolved round it*, from east to west, in twenty-four hours, carrying all the heavenly bodies with them. This system was believed, and enjoyed an undisputed celebrity, for 1400 years.

PUBE'SCENCE (*pubesco*, to begin to have a beard). The down of plants, consisting of soft short hairs, which partially cover the cuticle, as in geranium molle. Also, the soft hairy down of insects.

PUDDING-STONE. *Conglomerate.* Rounded water-worn fragments of rocks or pebbles, cemented together by another mineral substance, which may be of a siliceous, calcareous, or argillaceous nature.

PULLEY. One of the mechanical powers, consisting, in its simplest form, of a wheel, capable of turning about its axis, which may be either fixed or moveable. A cord passes over a portion of the circumference; if the axis of the pulley is fixed, its only effect is to change the direction of the force exerted by the cord; but if it is moveable, a mechanical advantage may be gained. Combinations of pulleys may be made in endless variety.

PULMOBRANCHIA'TA (*pulmo*, the lungs, *branchiæ*, gills). *Pulmonia.* An order of terrestrial *Gasteropods*, named from the resemblance between their mode of breathing and that of animals possessed of proper lungs. The *snail*, for instance, breaths air, which is alternately drawn into and expelled from a cavity lined with a vascular network. Many of these animals have no shell.

PULMONA'TA (*pulmo*, the lungs). An order of the Arachnida, comprising those species which breathe by means of pulmonary sacs. See *Tracheata.*

PULMONI'GRADA (*pulmo*, the lungs, *gradior*, to advance). An order of the *Acalephæ*, so named from the contractions and dilatations of their umbrella-shaped disc, by means of which they move, having some resemblance to the motion of the lungs in respiration.

PUMICE (*pumex*). A light spongy lava, chiefly felspathic, of a white appearance, produced by gases or watery vapour gaining access to the particular kind of glassy lava called obsidian, when in a state of fusion. It may be called the froth of melted volcanic glass. On account of its fibrous and vesicular state, it is so light as to float on water.

PUMP. A machine formed on the model of a syringe, for raising water from various depths to the surface of the earth. 1. In the *common suction pump*, the water is pressed into the pump-barrel by the atmosphere, and thrown out by lifting. 2. In the *lifting pump*, the piston is situated in the lower part of the barrel, and raises the water through the whole distance, by forcing it upward, without the agency of atmospheric pressure. 3. The *forcing pump* differs from both these, in having its piston solid, or without a valve, and also in having a side pipe, through which the water is forced, instead of rising in a perpendicular direction, as in the others.

Chain pump.—This kind of pump is used on board of ships, and consists of an endless chain moving over a wheel on the deck, which is turned round by winches, and over a roller in the pump-well, having saucers or flat circular pistons at certain intervals. Chain pumps, in large ships, throw out a ton of water per minute.

PULSE GLASS. A tube of glass, having a bore of about two lines in diameter, but at right angles at each end, where it is expanded into two bulbs of about 1½ inch in diameter. The instrument contains water or spirits of wine, the remaining space being a vacuum: if one bulb be grasped in the hand, the liquid will boil violently in the other, owing to the atmospheric pressure being removed from the surface of the liquid.

PUPA. A term literally denoting a baby wrapped up in swaddling bands, and applied to the *chrysalis*, or *nymph*, or second state of insect existence, in which, the last skin of the larva being thrown off, the animal appears in a different form, enveloped in an oblong case, without external limbs, and almost incapable of the slightest motion. See *Imago.*

PUPI'PAROUS (*pupa*, and *pario*, to produce). A designation of Dipterous insects, which bring forth their young in the pupa state. They comprise two families, known by the names of *forest-flies* and *bat-lice.*

PURBECK LIMESTONE. *Purbeck Beds.* Limestone strata, belonging to the Wealden Group, which intervenes between the Greensand and the Oolite. It is composed of fresh-water shells united by a calcareous cement. It is slaty, argillaceous, of a brownish colour, alternating with slaty marl, and sometimes containing beds of compact limestone.

PURPLE OF CASSIUS. A purple-coloured powder, precipitated when protochloride of tin is added to a dilute solution of gold.

PURPURIC ACID. An acid obtained from uric or lithic acid, remarkable for its tendency to form red or *purple*-coloured salts with alkaline bases. Its salts are called *purpurates*.

PURPURI'NÆ. A sub-family of the *Muricidæ*, named from the typical genus *Purpura*, including shells whose general form resembles that of the whelks.

PUTA'MEN (*puto*, to prune). A synonymous term for the *endocarp*, or innermost layer of the pericarp of osseous fruits.

PUTREFA'CTION. The spontaneous decomposition of animal or vegetable matters, attended with fœtor; a species of fermentation.

PUZZOLA'NO. A substance of volcanic origin, composed principally of pumice, of which a stratum is excavated in the neighbourhood of Pozzuoli, near Naples. The mortar which it makes with lime is called Roman cement.

PYCNITE (πυκνὸς, thick). A substance formerly considered as a variety of beryl, but now referred to topaz.

PY'RAMID. A solid figure, contained by planes which are constituted betwixt one plane and one point above it in which they meet. It differs from a cone, in having for its base a right-lined, instead of a circular figure. (See *Cone*). The ancients derived the term πυραμὶς or *pyramid*, sometimes from πῦρ, fire, because of its pointed shape; sometimes from πυρός, as if the *pyramids* had been *granaries!* No doubt the word, as well as the thing, is Egyptian.

PYRI'TES (πῦρ, fire). A compound of sulphur and iron, usually occurring in yellow shining crystals like brass, and in almost every rock, stratified and unstratified. The shining metallic bodies frequently seen in common roofing-slate afford a familiar example of the mineral. The term originally denoted a fire-stone, a sort of stone out of which fire could be struck; because, under particular circumstances, the stone produces spontaneous heat, and even inflammation.

PYRO- (πῦρ, fire). Words compounded with this term denote some change produced by the action of *fire*:—

1. *Pyr-acid*. An acid produced by the destructive distillation of an organic acid, as the *pyro*-citric, produced by decomposition of the citric by fire.

2. *Pyr-allolite*. A silicate of magnesia; a mineral belonging to the talc family, found in a lime-quarry in Finland. Its name is derived from its singular property of blackening before the blowpipe at a low-red heat, and afterwards becoming white at a higher temperature.

3. *Pyr-argillite*. A silicate of alumina and other matters, found in granite in Finland, emitting an argillaceous odour when heated.

4. *Pyro-chlore*. A new mineral found in Norway, in zircon-syenite. It is so called because it becomes yellow before the blowpipe, whereas polymignite retains its black colour.

5. *Pyr-eneite*. A greyish-black mineral, occurring in primitive limestone, and consisting of silica, alumina, lime, and iron.

6. *Pyro-ligneous Acid*. An acid obtained by distillation from wood; in its strongest form it is acetic acid. *Pyroligneous spirit* is a substance, more volatile than alcohol, produced during the distillation of wood. It is more correctly named *pyro-xylic* spirit.

7. *Pyro-lusite*. The most abundant ore of manganese, occurring crystallized and massive, in Devonshire, Warwickshire, Thuringia, Brazil, and other places. It is the binoxide of peroxide of manganese.

8. *Pyro-meter* (μέτρον, a measure). An instrument for measuring all degrees of heat above those which can be indicated by a mercurial thermometer. Wedgewood's pyrometer acts by the contraction of cylinders of fine white clay. The indications of Daniell's pyrometer depend on the difference in the expansion and contraction of a platinum bar, and a tube of black lead ware in which it is contained.

9. *Pyro-morphite* (μόρφη, form). Phosphate of lead, generally divided into *brown lead ore* and *green lead ore*. When heated before the blowpipe, it fuses into a globule, which assumes a polyhedral crystalline form as it cools.

10. *Pyr-ope*. Chrome garnet, generally called Bohemian garnet, occurring in rounded grains, and also imbedded in serpentine, &c.

11. *Pyr-orthite*. A silicate of oxide of cerium, iron, &c., found imbedded in granite or quartz, near Fahlun in Sweden. It resembles *orthite*, but is differently affected by heat.

12. *Pyr-osmalite*. A mineral occurring in magnetic ironstone, giving out vapours of chlorine before the blowpipe, and becoming a magnetic oxide of iron.

13. *Pyr-oxene*. The name given by Haüy to augite, a silicate of lime and

magnesia, found among volcanic rocks. It has received various names.

14. *Pyro-phorous.* A term applied to certain substances which, by the absorption and condensation of the aqueous vapour and gases contained in the atmosphere, become heated and ignited, as spongy platinum, which absorbs hydrogen and oxygen so readily, and then condenses them, that its entire mass becomes red-hot, and the gas is ignited.

15. *Pyro-phyllite.* A green radiated variety of talc from Siberia, composed of distinct groups of small diverging laminæ.

16. *Pyro-physalite.* A sub-species of prismatic topaz, from Fahlun in Sweden.

17. *Pyro-somata* (σῶμα, a body). A family of the *Tunicata,* consisting of minute animals aggregated together in great numbers, so as to form a hollow cylinder, which swims in the sea by the combined contractions and dilatations of all the individuals composing it, and is capable of emitting in the dark a brilliant phosphorescent light, or *body of fire,* as the name denotes.

18. *Pyro-techny* (τέχνη, art). The art which teaches the management and application of fire to certain operations; a term commonly applied to the preparation of artificial fireworks.

PYRULI'NÆ. Pear-shells; a subfamily of the Turbinellidæ, or Turnip-shells, named from the typical genus *pyrula,* and characterized by the shortness of the spire, by the smoothness and convexity of the pillar, and by the moderate length of the canal.

PYXI'DIUM (*pyxis,* a box). A fruit which dehisces by a transverse incision, so that, when ripe, the seeds and their placenta appear as if seated in a cup, covered by an operculum or lid, as in hyoscyamus, anagallis, &c.

PY'XIS NAUTICA. The Mariner's Compass; a modern southern constellation, placed in Argo.

Q

QUADRANT (*quadrans,* a quarter). A quadrant, in Geometry, is a quarter of a circle. The term also denotes an instrument for measuring angles, consisting of a quarter circle of wood or metal, having its circular part, or limb, divided into 90 parts, or degrees, and these subdivided into minutes, &c., by means of a Nonius or a Vernier.

1. *Hadley's Quadrant* is properly an *octant,* or eighth part of a circle, in which the angles are taken by means of the reflexion of light; and when the limb is extended to 60 degrees (the sixth of a circle), the instrument is called a *Sextant.*

2. *Quadrant of Altitude.* The name given to a flexible graduated slip of brass, which is fixed to the brazen meridian of the globe. By this the distance from one point of the globe to another can be obtained in degrees of arc. But as other arcs besides altitudes may be measured with it, it is sufficiently distinguished by calling it the *flexible arc.*

QUADRANT ELECTROMETER. An instrument for estimating the degree or intensity of electricity, invented by Mr. Henley. The differences of electric intensity are denoted by an index which traverses a quadrant divided into ninety equal parts, called *degrees.*

QUADRA'NTAL. A name formerly given to spherical triangles, one side of which is a quadrant.

QUADRA'TIC EQUATIONS. Quadratic equations are divided into *pure* and *adfected.* *Pure* quadratic equations are those which contain only the *square* of the unknown quantity, as $x^2 = 36$; $x^2 + 5 = 54$; $ax^2 - b = c$; &c. *Adfected* quadratic equations are those which involve both the square and the *simple power* of the unknown quantity, as $x^2 + 4x = 45$; $3x^2 - 2x = 21$; $ax^2 + 2bx = c + d$; &c.

QUADRA'TRIX. A name given to a curve which may be employed in the quadrature of other curves. Some of these have been specified; but, after all, the description of these curves assumes the point which they are intended to determine.

QUADRATURE (in Astronomy). The moon is said to be in her *quadrature,* when she is in either of the middle points of her orbit, between her conjunction and opposition, since lines from the earth to the moon and to the sun include a quadrant, or 90 degrees. Her face is then half-shown; it is bisected, or *dichotomized.* The places of her orbit, where she is either in conjunction or opposition, are her *syzygies.*

Quadrature in Geometry. By the quadrature of a curve is meant the finding of a square equal to the content enclosed by the curve. With regard to the famous problem of the *quadrature of the circle*—since the whole circular area is equal to the rectangle under the radius and a straight line equal to half the circumference, the object in squaring the circle is to determine the ratio of the circumference to the diameter, and this can only be expressed by infinite series.

QUADRILA'TERAL (*quatuor latera* habens). Having four sides; as applied to a plane geometrical figure, bounded by four straight lines. Such a figure is also called a *quadrangle.*

QUADRU'MANA (*quatuor*, four, *manus*, a hand). Four-handed; the designation of an order of Mammalia, including the monkey, the lemur, &c., which have a moveable thumb on their lower extremities opposed to the fingers; all their extremities are, in fact, instruments of prehension.

QUALITY OF PROPOSITIONS. In Logic, propositions are divided according to the quality of their *expression*, which is here the essential circumstance, into *affirmative* and *negative;* and according to the quality of their *matter*, which is accidental, into *true* and *false.*

QUANTITY (*quantus*, how much). Quantity is distinguished into continued and discrete. It is *continued*, when the parts are connected together, and is then termed *magnitude*, which is the object of geometry. It is *discrete*, when the parts have an unconnected and independent existence, and then constitutes *multitude* or *number*, which is the object of arithmetic.

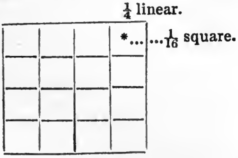
1. *Quantity, negative.* The difficulty attending the use of a minus or negative quantity, in algebraic operations, is removed at once by viewing it, as it always must be viewed, in reference to another quantity, which is plus or positive. A *debt* may be regarded as a negative quantity, inasmuch as it is a quantity *to be subtracted* in case of there being any property (which is *positive*), from which to subtract it. So also,

$$4 - 2 = 2;$$
$$4 - 2 \times 4 - 2 = 4;$$

Hence, — 2 is in reality — (+ 2); it is the plus or real quantity 4, — the real quantity 2.

Thus, a — quantity = a — (+ quantity).

2. *Quantity fractional.* It has excited surprise that $\frac{1}{4} \times \frac{1}{4}$ should be $\frac{1}{16}$. Let the question be tried geometrically, and the difficulty vanishes. It is only necessary to consider $\frac{1}{4}$ as the $\frac{1}{4}$ of a line 1; and the $\frac{1}{16}$ as the $\frac{1}{16}$ of the square of the same line. Thus—



Thus, the square of $\frac{1}{4}$ of 1 linear is $\frac{1}{16}$ of 1 square; the square of $\frac{1}{2}$ linear is $\frac{1}{4}$ superficial; and the square of $\frac{3}{4}$ linear is $\frac{9}{16}$, or $\frac{1}{2} + \frac{1}{16}$. All this would be evident if, instead of multiplication, we used the term quadration, or (if admissible) parallelogramization.

3. *Quantity, impossible or imaginary.* If an expression occur under the form $\sqrt{-a}$, this indicates an impossibility; for it signifies the square root of a negative quantity, which has no existence, since there is no quantity, positive or negative, which, being multiplied by itself, gives a negative result. An impossible quantity, or, in other words, the *even* root of a *negative* quantity, may be expressed in the form of a surd, as $\sqrt{-3}$, $\sqrt[4]{-a^2}$, &c.; the difference between surd and impossible quantities being that the former have *real* values, though we cannot exactly find them, while there *cannot* be a quantity, positive or negative, an even power of which would produce a negative quantity.

QUANTITY OF PROPOSITIONS. In Logic, propositions are divided according to their *quantity*, or extent: if the predicate is said of the *whole* of the subject, the proposition is *universal;* if of a *part* of it only, the proposition is *particular;* in the former, the subject is *distributed*, or stands for the whole of its significates; in the latter, it is not distributed, and stands for a part only of its significates.

QUANTITY and TANTITY. These terms are employed by Mr. Mill, in his "Elements of the Human Mind," as correlative, or, as he terms them, connotative; the word *quantus*, how much, being answered by *tantus*, so much. The common use, however, of the former word renders the latter superfluous. The term *quantuplicity*, as distinguished from quantity, means the answer to "how many times," as distinguished from "how much."

QUA-QUA-VERSAL DIP (*quâ-quâversum*, on every side). The dip of geological beds to all points of the compass around a centre, as in the case of beds of lava round the crater of a volcano.

QUARTA'TION (*quartus*, the fourth). An operation by which the quantity of one substance is made equal to a *fourth* part of the quantity of another: thus, in separating gold from silver, three parts of silver are added to the supposed gold, and they are then fused together, the gold thus becoming at most one-fourth of the mass only. They are then *parted* by the action of nitric acid.

QUARTILE. A term formerly employed in Astronomy to denote an *aspect* of two places when their longitudes differ by 90 degrees, or a fourth part of the circle.

QUARTINE (*quartus*, fourth). The name of the fourth membrane or envelope of the nucleus in plants, as described by Mirbel.

QUARTZ. A German provincial term, universally adopted in scientific language for a simple mineral, composed of pure silex, or earth of flints, extremely abundant in nature, from the common pebble to large mountain veins, and even entire rocks. See *Rock Crystal.*

QUARTZITE, or QUARTZ ROCK. An aggregate of grains of quartz, sometimes passing into compact quartz.

QUATE'RNARY (*quaternarius*, of the number four). A term applied in chemistry to those compounds which contain *four* elements, as gum, fibrin, &c. The term is also applied to any arrangement in which the prevailing number is *four*, as in the floral envelopes of Cruciferous plants, &c.

QUE'RCITRIN. The yellow colouring matter of quercitron bark. As it restores the colour of reddened litmus paper, and combines with and neutralizes bases, it has been considered an acid, and named *quercitronic acid.*

QUICKLIME. The protoxide of calcium, obtained by exposing carbonate of lime to a strong red heat, so as to expel its carbonic acid.

QUI'NARY (*quinarius*, of the number five). A term applied to a system in which the prevailing number is *five*, as observed in the floral envelopes of most dicotyledonous plants.

QUINCUNX. In Botany a form of æstivation or vernation, in which there are five leaves, two of which are exterior, two interior, and the fifth covers the interior with one margin, while its other margin is covered by the exterior, as in the rose.

QUINDE'CAGON. A geometrical figure bounded by fifteen sides.

QUINTILE. A term formerly employed in Astronomy, to denote a distance in longitude of 72 degrees, or a fifth part of the circle.

QUI'NTINE (*quintus*, fifth). The fifth membrane or envelope of the nucleus of plants, as described by Mirbel. This is the *vesicula amnios* of Malpighi, the "additional membrane" of Brown, and the *sac of the embryo* of Brongniart.

QUO'TIENT or QUOTE (*quoties*, how often). The result of dividing one number by another.

R

RABDO'LOGY (ῥάβδος, a rod, λόγος, a description), *Rhabdology*. A method for performing the arithmetical operations of multiplication and division, by means of an instrument invented by Lord Napier, and termed from him *Napier's rods* or *bones*. The mode of calculation is tedious, and is now superseded by the use of logarithms.

RACES OF MAN. Under the terms *Caucasian*, *Mongolian*, *American*, *Ethiopian*, and *Malay Race*, will be found the characteristics of these divisions, according to Blumenbach. The *Races* are different forms of one species, capable of fruitful union, and propagated by generation.

RA'CEME (*racemus*, a bunch of grapes). A form of inflorescence, in which all the buds of an elongated branch are developed as flower-buds, and at the same time produce peduncles, as in hyacinth.

RACE'MIC ACID (*racemus*, a bunch

of grapes). *Paratartaric Acid.* An acid obtained from the grape, similar in its composition to tartaric acid, with which it is consequently isomeric.

RA'CHIS (ῥάχις, a ridge). This term, which should be written *rhachis*, denotes, in Botany, that form of floral axis in which several pedicles, or flower-stalks, are developed at short distances from each other, as in grasses.

RA'DIANT (*radius*, a ray). In Geometry, a radiant is a straight line proceeding from a given point, or fixed pole, about which it is conceived to revolve.

RA'DIANT POINT. That point from which the *rays* of light diverge from a luminous body in all directions. The point in which convergent rays meet, is the *focus*.

RADIA'RIA (*radius*, a ray). A term applied by Lamarck to that class of the *Radiata* of Cuvier, which contains species with a radiated form of the entire body. They are distinguished into the soft and gelatinous, as the medusa; and the hard, spiny, and echinodermal species, as the asterias.

RADIA'TA (*radius*, a ray). The designation of animals, most of which are disposed around an axis in a radiated form, as the star-fish. They compose one of the four great divisions of the animal kingdom.

RADIA'TION (*radius*, a ray). A term applied to the emission of light, or of heat, from the surface of a luminous or of a heated body, in the form of *radii*, or *rays*. In natural philosophy, whatever sends forth emissions in all directions, is said to *radiate;* and hence we have radiation, not only of heat and of light, but also of sound.

RADICAL (*radix*, a root). A term applied generally to any substance which is capable of combining with simple bodies. A radical is termed *simple*, when it is itself an elementary body, as chlorine in hydrochloric acid; or *compound*, when, though itself a compound, it acts as a simple body in its modes of combination, as cyanogen in the cyanides. In general terms, a *radical*, simple or compound, forms an *acid* with hydrogen, and a *salt* with a metal.

RA'DICAL SIGN (*radix*, a root). In Algebra, the radical sign is the symbol $\sqrt{}$, and denotes the extraction of a root. It is a modification of the letter *r*, the initial letter of *radix*, or root. See *Root*.

RA'DICLE (*radicula*, a little root). The rootlet, or the rudiment of the descending axis of plants, as it occurs in the embryo.

RA'DIUS. A rod; a spoke of a wheel. The semi-diameter of a circle, or a right line drawn from the centre of a circle to the circumference.

1. *Radius of Curvature.* In speaking of the concavity of other curves than the circle, the radius of curvature at a given point is the radius of a circle which has the same curvature as the curve has at that point.

2. *Radius Vector.* The radius vector is a right line drawn from the centre of force (in any curve, on which a body is supposed to move by centripetal force) to that point of the curve where the body is supposed to be. It is a general radius to the curve, and has the addition of *Vector*, or carrier, because it is imagined to *carry* forward the body to which it is attached. The earth, for example, moves in an elliptic orbit, of which the sun (the centre of force) is in one of the foci; and, by consequence, the radius vector is continually increasing in length during her course from the perihelion to the aphelion, and decreasing in the same proportion in the progress of her return.

RA'DIX. Literally, a root; and, hence, applied, in arithmetic, to the fundamental of any system of numeration. Thus, 10 is the radix of the decimal system, and of the common system of logarithms.

RAIN. When the temperature of the air is above 32°, or the freezing point, the water separated from the air falls to the earth in the state of *rain*. It is generally thought that the precipitation of water from the atmosphere is the effect of the mingling together of currents of warm and of cold air.

RAINBOW. A meteor in form of a party-coloured arch, or semicircle, exhibited only at the time when it rains. It is always seen in that point of the heavens which is opposite to the sun, and is occasioned by the refraction and reflection of his rays in the drops of falling rain. The *secondary rainbow* may be explained by supposing a double refraction and reflection of the sun's beams.

RAIN GAUGE. An instrument for ascertaining the comparative quantity of rain which falls in different places and in different seasons. It is sometimes called *pluviometer*.

RA′LLIDÆ (*rallus*, the rail). The Rail tribe; a family of the *Grallatores*, or Wading birds, characterized by the extreme length of the toes.

RAME′NTA (*rado*, to scrape off). Filings, as of a metal. In Botany, the term denotes the thin, brown, foliaceous scales, which appear on the back of the fronds of ferns, &c.

RAMO′SE (*ramosus*, branched). A term applied to those spines upon shells which send out others in a lateral direction.

RAMPHA′STIDÆ (*ramphastos*, the toucan). The Toucans; a family of Scansorial birds, placed by Cuvier in his third order, *Grimpeurs*, between the *anis* (*Crotophaga*) and the parrots.

RANCI′DITY. The change which oils undergo by exposure to the air. It depends on the combination of oxygen with the extractive principle, which is naturally united with the oily principle. The result is, therefore, analogous to the oxidation of metals.

RA′NIDÆ (*rana*, a frog). The Frog tribe; one of the principal divisions of the Anoural order of Amphibious animals, which pass from the tadpole to the perfect state, and are adapted for aquatic life. See *Bufoidæ*.

RANUNCULA′CEÆ. The Crowfoot tribe of Dicotyledonous plants. Herbaceous plants with divided *leaves*, opposite or alternate; *calyx* of 3-6 petals; *petals* 5-15, hypogynous; *stamens* hypogynous, indefinite in number; *fruit* distinct, simple carpella, and albuminous seeds.

RA′PHIDES (ῥαφὶς, a needle). Small acicular crystals, found within the cells of the parenchyma of certain plants.

RAPTO′RES (*raptor*, a snatcher). *Raptrices*. Plunderers, or Birds of Prey; an order of birds, characterized by the robustness and muscularity of the whole body, by the strength of the legs and of the bill and talons, by their rapacious habits, solitary disposition, great quickness of sight, and powerful flight. They are distinguished into the *diurnal*, containing the vultures, eagles, falcons, &c., and the *nocturnal*, or the owls.

RAREFA′CTION (*rarus*, thin, *facio*, to make). The act of rendering a substance less dense; also, the condition of diminished density. The term is generally applied to elastic fluids, which expand on the application of heat, or in consequence of partial exhaustion, and thence become thinner or more rarefied.

RA′RITY (*rarus*, thin). A property of matter opposed to *density*, and denoting a thinness or subtlety of bodies: mercury is a dense fluid, ether a rare one. The term is generally applied to aëriform bodies, those of *dilatation* and *expansion* being employed in speaking of solids and liquids.

RAS ALGRATHA. A star of the third magnitude in the northern constellation Hercules. *Ras Aliagus* is the principal star in the northern constellation Serpentarius.

RASO′RES (*rado*, to scratch). *Radrices*. Scratchers; an order of *gallinaceous* Birds, so named from the general habit which these graminiferous species present of scratching up the soil to obtain their food. The only general character of the order is derived, according to Macgillivray, from the digestive organs. "A very large dilatation of the œsophagus, forming a crop, lying, when distended, equally on both sides of the neck, and such an enlargement of the cœca as to render their capacity at least half of that of the intestine, occur together in no other birds. It is very difficult to assign general characters of any other kind to them."

RA′STABER. A star of the third magnitude in the northern constellation Draco.

RA′THOFFITE. A species of garnet, found in Sweden, accompanied by calcspar and hornblende.

RA′TIO. When two subjects admit of comparison, with reference to some quality which they possess in common, and which may be measured, this measure is their *ratio*, or the rate in which one exceeds the other. With this term is connected that of *proportion*, which denotes the *portions*, or parts of one magnitude which are contained in another. In the language of Mathematics, the term *ratio* has been adopted to express what is more generally understood by the term proportion: thus, instead of "the proportion which" one thing bears to another, we say, "the *ratio* which" one bears to the other, meaning its comparative magnitude; instead of saying that A is to B "in the proportion of 5 to 6," we say, "in the ratio of 5 to 6."

1. When the *ratio* is *commensurable* (that is, when it is reducible to numbers), it is equivalent to *proportion;* the latter term is, however, usually employed in the comparison of *ratios*, in which case two ratios are said to be *proportionals.* Thus, 3 has to 4 a certain *ratio*, or *pro-*

portion; but the expression 3 is to 4 in the same proportion as 6 to 8, denotes that the ratios of 3 to 4 and 6 to 8 are equal; 3 bearing the same proportion to 4, as 6 to 8, that is, being three-fourths. Ratios, however, may be unequal. Thus it is said that the ratio of 9 to 4 is greater than that of 7 to 6, because $\frac{9}{4}$ is greater than $\frac{7}{6}$; it being thus that ratios are measured.

2. *Ratio, direct.* When two quantities, or magnitudes, have a certain ratio to each other, and are, at the same time, subject to increase or diminution; if, while one increases, the other increases in the same ratio, or if, while the one diminishes, the other diminishes in the same ratio, the *proportions*, or comparisons of ratios, remain unaltered, and those quantities, or magnitudes, are said to be in a *direct ratio* or proportion to each other. Thus if a yard of cloth be worth a pound, ten or any number of yards will be worth so many pounds, and the proportion of value continues unaltered.

3. *Ratio, inverse.* But, if the quantities, or magnitudes, are such, that, when one increases, the other necessarily diminishes; and *vice versâ,* when the one diminishes, the other increases, the *ratio*, or proportion, is said to be *inverse.* Thus, there is, at any moment, a certain ratio of the length of the day to that of the night; but this is an *inverse ratio*, for in proportion as the length of either *increases*, that of the other must *diminish.*

4. *Ratio, compound.* A compound ratio is made up of the product of two, or more, simple ratios; that is, of the product of their first terms, which are called *antecedents*, compared with the product of their second terms, called *consequents.* Thus 24 : 3 is a compound ratio of 4 : 1 and 6 : 3; this, being made up of two simple ratios, is called a *duplicate* ratio. When three simple ratios are compounded, they form a *triplicate* ratio; when four, a *quadruplicate* ratio; and so of other compounds.

5. *Ratio, Extreme and Mean.* A line is said to be so divided, when the rectangle under the whole line and the lesser segment is equal to the square of the greater segment; and, hence, the whole line is to the greater segment, as that greater segment is to the lesser. The segments of such a division, being incommensurable with the whole line, cannot be exactly given in numbers, but the geometrical construction is easy. See *Euclid's Elements*, book ii. prop. 11.

RATIONAL QUANTITY. A quantity, algebraic or arithmetical, which can be expressed without the use of the signs of evolution, such as those of the square root, the cube root, &c. See *Irrational Number.*

RAY (*radius,* a beam or rod). A single radiation, or the smallest form in which light or caloric is emitted from bodies. *Calorific* rays are those rays which excite heat; *luminous* rays, those which impart light; *chemical* rays, those which, without producing heat or light, produce chemical change, as that of darkening the white chloride of silver. The last are also called *deoxidizing* or *hydrogenating* rays, from their characteristic effect in withdrawing oxygen from water and other oxides.

REA'CTION. The resistance made by all bodies to the action or impulse of others, which endeavour to change their state, either of motion or of rest. *Action* and *reaction* are always equal to each other; that is, the effect which any force exerts—or, what is the same, its momentum — is equal to the resistance which the body it sets in motion offers to it. The intensity of the moving power is therefore estimated by the mass and velocity of the body set in motion.

REA'GENT or TEST. In Chemistry, a substance which indicates the presence of any body existing in a minute proportion in a solution, by rendering it turbid, by imparting a particular colour to it, or by depositing a precipitate. Thus, a *solution of nitrate of silver* is a most powerful reagent in detecting *chloride of sodium.*

REAL DEFINITION. A definition which explains the nature of the thing defined; viz. either the whole nature of it, as in Mathematics, or else something beyond what is necessarily understood by the term (see *Nominal Definition*). In the strict sciences, the nominal and the real definition exactly coincide; the *meaning of the word*, and the *nature of the thing*, being exactly *the same.* This holds good also with respect to logical terms, most legal, and many ethical terms.

REA'LGAR. The protosulphuret of arsenic. It is either *native*, and dug out of the earth in China; or *factitious*, procured by boiling orpiment, or the sesquisulphuret, in subliming vessels.

RE'ALISM. The opinion of a class of

philosophers, that Genus and Species are some real *Things*, existing independently of our conceptions and expressions; and that, as in the case of Singular terms there is some real individual corresponding to each, so, in Common terms also, there is some Thing corresponding to each; which is the object of our thoughts when we employ any term. This doctrine, though attributed to Aristotle, is by him expressly contradicted. See *Nominalists.*

REASON. Whately has pointed out several of the ambiguities to which this word is liable. It is used to signify, 1, all the intellectual powers collectively; 2, those intellectual powers exclusively in which man differs from brutes; 3, the faculty of carrying on the operation of the mind, which logicians call *reasoning;* 4, the premiss or premises of an argument, especially the minor premiss; and it is from Reason in this sense that the word "*Reasoning*" is derived; 5, lastly, it is often used to signify a *cause*, as when we say, in popular language, that the "Reason of an eclipse of the sun is, that the moon is interposed between it and the earth." This should be strictly called the *cause.*

"What adds to the confusion is, that the Cause is often employed as a Proof of the effect: as when we infer, from a great fall of rain, that there is, or will be, a flood; which is at once the physical effect, and the logical conclusion. The case is just reversed, when from a flood we infer that the rain has fallen."

REASONING IN A CIRCLE. A fallacious mode of reasoning, in which the truth of a proposition is asserted by adducing the conclusion. The following is Whately's illustration:—"To allow every man an unbounded freedom of speech must always be, on the whole, advantageous to the state; for it is highly conducive to the interests of the community, that each individual should enjoy liberty, perfectly unlimited, of expressing his sentiments."

RECEIVER. A glass vessel employed in pneumatical experiments for containing the object on which an experiment is to be exhibited by means of the air-pump. In Chemistry, the term denotes a vessel fitted to the neck of a retort, alembic, &c., for the purpose of receiving the products of distillation.

RECE'PTACLE. In Botany, the dilated and depressed axis of the inflorescence termed *capitulum*, constituting the *seat* of the artichoke, &c. The receptacle is called *torus* or *thalamus*, and in Greek compounds has the name of *clinium.* To this part may be referred the gynophore, the polyphore, and the gynobase of botanical writers.

RECI'PROCAL (*reciprocus*, mutual; flowing backward or forward). A term employed in mathematics to denote a fraction which is formed by inverting another fraction; thus $\frac{3}{7}$ is the reciprocal of $\frac{7}{3}$; and $\frac{1}{7}$, the reciprocal of 7 or $\frac{7}{1}$. A *reciprocal property* is that which each of two things has with reference to the other; thus, if A and B are what is called conjugate diameters of a conic section, the tangent at either extremity of A is parallel to B, and that at either extremity of B is parallel to A. Hence, these lines are *reciprocally* connected with each other, and are therefore called conjugate; for the term conjugate, which denotes joined, generally means joined by a reciprocal property.

RECTA'NGLE (*rectum angulum* habens). A geometrical term, denoting a right-angled parallelogram, or any figure of which all the angles are right angles. A rectangle is said to be *contained* by any two of its adjoining sides. The areas of all figures whatever, whether bounded by straight lines or curves, are expressed by those of equivalent rectangles.

RECTIFICA'TION. In Chemistry, the repeating of a distillation or a sublimation several times, in order to render the substance purer and finer.

RECTIFICA'TION (in Mathematics). The finding of a right line equal in length to an arc of a curve. The term is thus analogous to that of quadrature, as applied to the finding of its area; for as an area is considered to be found when a square equal to it has been exhibited, so the length of an arc is known when a straight line equal to it has been found.

RECTILI'NEAL (*recta linea*, a right line). A term applied in Geometry to all figures which are contained by right lines, as a triangle, a square, &c.

RECURRING DECIMAL. *Circulating Decimal.* For the *exact* expression of a vulgar fraction by a decimal, the former must either have, or be capable of being reduced to another which has 10 or some power of 10 for its denominator. Otherwise, the decimal will go on interminably, *the same figure or figures recurring in the same order.* These are called recurring, repeating, or circulating decimals, and the part repeated is called the *period* or *repetend*. A *pure* circulator is one in which the period begins immediately after the point; all others are called *mixed*.

RED CHALK. Red clay, or reddle; an argillaceous iron-stone ore.

RED FIRE. A pyrotechnical compound of nitrate of strontia, sulphur, antimony, and chlorate of potash, which burns with a red flame.

RED LEAD. *Minium*. An oxide of lead with a fine red colour, with a shade of yellow. It is intermediate between the protoxide and the peroxide.

RED MARL. Variegated Red Sandstone; a sandstone with an argillaceous cement, often containing beds of red or variegated marl, and subordinate beds of reddish oolite and dolomite, with clays containing gypsum and salt.

RED PRECIPITATE. The red oxide of mercury, or mercuric oxide, obtained by the decomposition of the nitrate of mercury by heat.

REDU'CTION. A rule in arithmetic by which we find the quantity in one denomination corresponding to a quantity expressed in another denomination; by which, for example, we find how many shillings there are in a certain number of pounds, how many pounds in a certain number of shillings, &c. In the former case the reduction is termed *descending*, and is performed by multiplication; in the latter it is *ascending*, and is performed by division.

REDU'CTION OF METALS. The conversion of the oxides of metals into the metallic state, by the application of heat; the operation consists in mixing them with some substance which will attract the oxygen from the oxides; coal is the substance generally employed for this purpose.

REEF, or CORAL REEF. A peculiar kind of rock produced by the coral animalcule, found in the ocean, of considerable length, of very narrow width, and generally only a few feet below the surface of the water. Reefs are usually of a circular or oval form, surrounded by a deep sea, the interior generally presenting the appearance of a shallow lagoon. But they appear under various forms.

REFERENCES, FALLACY OF. An artifice sometimes employed by dishonest writers, consisting in the merely giving of *references* to authorities, which may be conceived favourable to the writers' views; it is supposed that few will take the trouble of examining the passages referred to, and that the confirmation of the writers' statements by such authorities will be taken for granted.

REFINING. The operation of purifying any thing; particularly the assaying or purifying of gold and silver, by separating them from other bodies which are combined with them.

REFLECTING CIRCLE. An astronomical instrument destined for the same uses as the sextant, but more complete, the circle being entire, and the divisions carried all round. It is usually furnished with three verniers, so as to admit of three distinct readings off, by the average of which the error of graduation and of reading is reduced.

REFLE'CTION (*reflecto*, to bend back). In Physics, this term denotes the rebound of the rays of light, of heat, or of sound, from an opposing surface. Polished surfaces reflect light to the eye, and are, therefore, more generally termed *reflectors* or mirrors. Heat and sound are reflected without relation to the eye, and are returned from more rugged surfaces.

Reflecting microscopes and telcscopes are such as carry a magnified image of the object to the eye, by means of rays *reflected* from a concave speculum.

REFRA'CTION (*refractus*, broken back). That property of light, by which a ray becomes *refracted*, or bent back, when passing in an oblique direction from a rarer into a denser medium, and *vice versâ*. The phenomenon may be observed on immersing one end of a rod, in a slanting direction, in a vessel of water: the part immersed appears as if it were bent, or broken, at the surface of the liquid. This is termed *ordinary refraction*.

1. *Refraction, double*. A property of certain transparent minerals, as Iceland spar, by which a ray of light, after entering such a medium, becomes divided into two portions or rays, each of which presents an image of the object. One of these rays follows the *ordinary* law of the sines, and the other is refracted according to a new or *extraordinary* law; hence these two rays have been termed the *ordinary ray*, and the *extraordinary ray*, respectively.

2. *Refraction, index of*. A term applied to the ratio which subsists between the *sines* of the angles of incidence and of refraction, which is also in every case a constant ratio.

3. *Refraction, terrestrial and celestial.* In astronomical and meteorological observations it is found that every difference of level, accompanied, as it must be, with a difference of density in the aerial strata, must also have, corresponding to it, a certain amount of refraction. That which occurs between terrestrial stations is termed *terrestrial refraction*, to distinguish it from that total effect which is produced only on celestial objects, or such as are beyond the atmosphere, and which is called astronomical or *celestial refraction.*

4. *Refracting microscopes and telescopes* are such as show a magnified image of an object, by means of rays of light *refracted* and collected into a focus through lenses.

REFRANGIBI′LITY (*refrango*, to break back). The property by which a ray of light admits of being refracted. The term is employed to designate the degree of this property which is possessed by the several divisions of a ray of light. It is owing to their various *refrangibilities* that the rays separate from each other in passing through the prism, thereby exhibiting the phenomenon of the coloured *spectrum.*

REFRIGERA′TION (*refrigero*, to cool). The operation of cooling a body; also the condition of a body which has been cooled. A *refrigeratory* is a chemical vessel filled with water, for the purpose of condensing vapours, or for cooling any substance as it passes through it.

REGMA (*ῥήσσω*, to break). *Capsula tricocca.* A fruit, consisting of three or more cells, each of which bursts from the axis with elasticity into two valves, as in Euphorbia. The cells of this kind of fruit are called *cocci.*

REGULAR BODIES. A term applied to the five regular geometrical solids, viz. the tetrahedron, the hexahedron, the octahedron, the dodecahedron, and the icosahedron; these are bounded by like, equal, and regular plane figures, and their solid angles are all equal. They were described by Plato, and are hence called *Platonic bodies.*

REGULAR FIGURES. These are equilateral and equiangular polygons. About and within such figures circles can be described.

RE′GULARS. In chronology, there are two kinds of *Regulars*, the solar and the lunar.

1. The *Solar Regulars* are fixed numbers attached to each month. The regular for—

April and July, is	1
January and October	2
May	3
August	4
February, March, November	5
June	6
September and December ...	7

The Regulars are used with the Concurrents in ascertaining on what day of the week the first day of each month fell. The Regulars of the month being added to the Concurrent of the year, the sum, if it does not exceed 7, shows the day of the week required, 1 representing Sunday, 2 Monday, and so on. If it exceed 7, that number is to be subtracted, and the remainder shows on what day of the week the first day of each month in that year fell. Thus, if the day of the week of the 1st December, 1272, be required: Regular of December (7) + Concurrent of A.D. 1272 (5) = 12. Subtract 7, and the remainder, 5, denotes the 5th day of the week, or Thursday.

2. The *Lunar Regulars* consist also of a fixed number assigned to each month of the year. By adding thereto the Epact, the age of the moon on the first day of each month is ascertained. The following is a table of the Lunar Regulars, according to the calculations of those who began the year in January or March :—

January and March............	9
February and April............	10
May..................................	11
June	12
July..................................	13
August	14
September and October	16
November and December ...	18

If the lunar year commenced in the month of September, as with the Egyptians, and four months before the Julian year, the Lunar Regulars for September and October are 5, and for November and December 7; but for all the other months, the numbers are those in the preceding table.

By adding the Lunar Regulars to the Concurrent of any particular year, the day of the week is shown on which the first day of the Paschal moon fell. If the sum does not exceed 7, the day following was the first of the Paschal moon; if the Lunar Regulars and Concurrent exceed

7, that number must be subtracted, and the remainder shows that the next day was the first of the Paschal moon.—*Sir H. Nicolas.*

RE′GULUS (*rex*, *regis*, a king). The name given by the alchemists to the metallic matters which were separated from other substances by fusion, from their expecting to find gold, the *king* of metals, at the bottom of the crucible. The term has since been applied to some metals when extracted from their ores, as regulus of antimony, &c.

RE′GULUS (in Astronomy). A star of the first magnitude in the zodiacal constellation Leo. It is also called α Leonis, or Cor Leonis. By Ptolemy and other Greeks it was called βασιλίσκος, whence is derived the Latin name Regulus, the diminutive of Rex.

RELATIVE and CORRELATIVE. The nature of relative terms has been explained under the article *Absolute and Relative.* Terms are *correlative* to each other, which denote objects related to each other, and viewed as in that relation. Thus, though a king is a ruler of *men*, "king" and "man" are not correlative, but king and *subject* are.

REPEATING CIRCLE. An astronomical instrument, invented by Borda, by which the error of graduation may be diminished to any degree, and, practically speaking, annihilated. By this instrument the observer is enabled to repeat or multiply the observation, by reading it off successively on different parts of the graduated limb. A number of values being thus found, the mean of the whole is taken as the correct result.

REPETE′ND (*repetendus*, to be repeated). The part of a circulating decimal which is perpetually repeated. It is called *simple*, when the figures are the same; and *compound*, when they vary.

REPLUM. A leaf of a door. In Botany, the framework formed by the separation of the two sutures of a legume from its valves.

REPTATRI′CES (*repo*, to creep). Creepers; an order of Climbing birds, which have the three fore toes more or less united at the base, and spreading little. They are thus distinguished from the Scandrices, or Climbers, in which the outer toe is directed outwards or backwards.

REPTI′LIA (*repo*, to creep). The third class of Vertebrate animals, consisting of reptiles, most of which are terrestrial. They are characterized by cold-bloodedness, oviparous reproduction, the absence of metamorphosis, and the protection of the skin by means of hard plates or scales.

REPULSION (*repello*, to drive back). That property of natural bodies, by which, under certain circumstances, they repel, or fly off from, each other. It is an effect of *caloric*, by which the particles of a body, into which it enters, are removed from each other. It is the opposite of that form of attraction which is termed *cohesion.*

Repulsion, in Electricity. The law by which light bodies fly off from an electrified surface, after contact.

RESI′DUAL. An expression which gives the remainder of a subtraction, as $a - b$. A *residual phenomenon* is that part of a phenomenon which remains when every part which is capable of explanation has been removed.

RESIN. A volatile oil, rendered concrete by combination with oxygen.

RESI′STANCE. A term applied, in Physics, to any power by which motion, or a tendency to motion, is impeded or prevented. Thus, the atmosphere offers resistance to the path of a projectile, the water to the passage of a ship, inequality of surface to the movement of bodies on one another, &c.

RESOLUTION OF FORCES. This term denotes, in physics, the finding of several forces, their directions, and intensities, which by their joint action have moved a body, exactly as it would have been moved by a single force of determinate intensity and direction. See *Force.*

RE′SONANCE (*resono*, to sound again). That property of sonorous bodies by which they acquire the same vibrations as are possessed by a body emitting a sound; they thus vibrate with it, and strengthen the original note. A tuning-fork emits a louder sound when its handle is placed on a table; the notes of a musical box are louder when the box is placed upon a table.

RESU′LTANT. A term applied in physics to such a *single force* as is equivalent to the effects of all the moving forces in any compound motion; in other words, it is the force which *results* from the *composition* of two or more forces acting upon a body. See *Forces, Composition of.*

RETI′CULUS RHOMBOIDA′LIS. A modern southern constellation, consisting of ten stars.

Rhizopod

RETINA'PHTHA. A compound of carbon and hydrogen, formed by dropping resin into a red-hot cylinder.

RE'TINITE. *Retinasphalt.* A substance consisting of resin, asphalt, and earth, found at Bovey Tracey adhering to brown coal.

RETITE'LÆ (*rete*, a net, *tela*, a web). A family of Spiders, which spin webs of an open mesh-work and of an irregular form, and remain in the middle or on one side, in order to seize their prey.

RETORT. A globular vessel of glass, or porcelain, with a long neck bended on one side, used for distillation, or decomposition by the application of heat.

RE'TROGRADE (*retro*, backward, *gradior*, to go). A term used in Astronomy, in opposition to *direct*. Thus, all motion from east to west, as the apparent motion of the heavens, is retrograde; while the earth's diurnal motion, which causes it, is direct.

REU'SSITE. A substance consisting of several sulphates, and occurring in the form of a mealy efflorescence on the surface of the earth about Seidlitz and Seidschutz.

REVERBERATORY FURNACE. That kind of furnace, in which the flame is driven back, or prevented from rising.

REVERSE SHELLS. Shells which have the aperture opening on the left side when placed in front of the spectator.

REVERSION OF SERIES. A term sometimes confounded, in Mathematics, with *inversion*. Thus, the connexion of the square root with the square is described as *inverse;* but if *y* be a given series of powers of *x*, the determination of *x* in a series of functions of *y* is not called inversion, but *reversion*.

REVIVIFICA'TION (*revivisco*, to begin to live again). In Chemistry, this term has been applied to the *reduction of metals*. In natural history, it denotes a phenomenon which occurs in some animalcules, as the *rotifer redivivus*, which lives in water, but, after remaining for years in a dry state, with all its functions suspended, *revives* in a few minutes on being placed in water.

REVOLUTION. In pure mathematics, this term denotes an angle moved over by a line which revolves round a point from any one position to that position again. It is, therefore, a synonym for four right angles.

RHAMNACEÆ. The Buckthorn tribe of Dicotyledonous plants. Trees or shrubs with *leaves* alternate ; *flowers* axillary or terminal, polypetalous ; *petals* cucullate ; *stamens* perigynous ; *ovarium* superior ; *seeds* albuminous.

RHINOLOPHI'NÆ (ῥὶν, the nose, λόφος, a crest). A family of the insectivorous Cheiroptera, named from the peculiar form of the anterior nasal appendage, and including the greater and lesser *horse-shoe bats* of our own country.

RHIPI'PTERA (ῥιπὶς, a fan, πτερὸν, a wing). Fan-winged insects ; an order of insects, which have only one pair of wings fully developed, and these are on the *metathorax ;* the other pair are rudimentary. See *Diptera*.

RHI'ZANTHS (ῥίζα, a root, ἄνθος, a flower). A class of parasitical leafless plants, which, with many of the peculiarities of Endogens, seem to constitute an intermediate form of organization between them and the *lower* Acrogens. They are all of a fungus-like consistence, with few traces of a vascular system ; the *flowers* are propagated by the agency of sexes ; the *seeds* have no embryo, but consist of a homogeneous sporuliferous mass.

RHIZOCA'RPOUS (ῥίζα, a root, καρπὸς, fruit). A botanical term applied to those polycarpous fruits, whose root endures many years, but whose stems perish annually, as herbaceous plants.

RHIZOME (ῥίζωμα, that which has taken root). A root-stock, or *root-like stem*, which lies prostrate on the ground, and emits roots from its under side, as in iris.

RHODIUM (ῥόδον, a rose). A new metal discovered in the ore of platinum, and named from the red colour of one of its solutions.

RHODIZONIC ACID (ῥόδον, a rose). An acid derived from carbonic oxide, and named from the red colour of its salts.

RHO'DONITE. A fibrous ore of manganese, consisting of silica and the protoxide of manganese.

RHOMB-SPAR. A variety of *manganesian limestone*, composed of the carbonates of lime and of magnesia, and occurring imbedded in chlorite slate, limestone, &c. It has been called bitter spar and muricalcite.

RHOMBOID (ῥόμβος, a rhombus, εἶδος, likeness). A four-sided figure, which has its opposite sides equal to one another, but all its sides are not equal, nor its angles right angles. It is, in fact, a compressed parallelogram.

In Crystallography, the *rhomboid*, or *rhombohedron*, as it is sometimes called, is a figure contained within six equal rhombs; two only of its solid angles are formed by the union of three equal plane angles, and these are called the terminal solid angles; the other six, which are similar to one another, are lateral solid angles. This form would result from elongating or compressing the cube in the direction of a line passing through two of its opposite solid angles; in the former case an *acute*, in the latter an *obtuse* rhomboid would result.

RHOMBUS (ῥόμβος, a rhomb). A four-sided figure, which has all its sides equal; but its angles are not right angles; it is an equilateral oblique parallelogram.

RHUMB-LINE (*rumbo*, or *rumo*, Portuguese, a course). not The shortest line which can join two points on the globe, cutting all the meridians which it crosses at the same angle; when delineated on the globe, it forms a curve termed the *loxodromic curve.*

RHUMBS. The thirty-two points of the horizon, as marked on the circle of the mariner's compass; they serve to calculate the angle which a ship's course makes with the magnetic needle.

RHUTE'NIUM. This, and *Pluranium,* are names of two supposed metals, contained in the insoluble residue left after the action of nitro-muriatic acid on the Uralian ore of platinum.

RHY'NCHOLITHES (ῥύγχος, a beak, λίθος, a stone). Beak-shaped fossils; the extremities of the mandibles of Cephalopods, allied to the nautilus.

RHYNCHO'PHORÆ (ῥύγχος, a muzzle, φέρω, to bear). The Weevil tribe; a family of the tetramerous *Coleoptera,* characterized by the prolongation of the anterior part of the head into a kind of muzzle.

RHYNCHOSA'URUS (ῥύγχος, a beak σαῦρα, a lizard). A fossil animal presenting certain characters, which connect the great class of reptiles, on one hand with the birds, and on the other with quadrupeds. The skull and several bones of the extremities of this animal were found some years ago in the Grinsill quarries, near Warwick.

RHYTIDO'MA (ῥύτις, a wrinkle). The name given by Mohl to the deciduous scales of the bark of trees produced by the formation of epiphlœum inside the liber or mesophlœum.

RIGEL. A star of the first magnitude, on the left foot of Orion.

RIGHT (in Mathematics). A term generally used as opposed to *oblique.* Its use may, however, have arisen from an idea of simplicity: a *right line* is a straight line, and the latter has been defined to be "the shortest way between two points." A *right angle* is formed by two right lines perpendicular to each other, and contains 90°; it is the most simple of angles. A *right cone,* cylinder, prism, pyramid, &c., are those whose sides are perpendicular, or at right angles, to the plane of the base.

RINGENT (*ringo,* to grin). A term applied in Botany to certain corollas, the petals of which cohere into the form of a mouth, which *gapes* on pressing the sides, as in Antirrhinum.

RINGS, FAIRY. The fanciful name given to patches or to circles of luxuriant grass, observed in fields; they are supposed to owe their luxuriance to the nutritive influence of decaying fungi.

RIPPLE-MARK. A term applied by Geologists to the undulations which occur on the surface of many rocks, resembling the ridges and indentations left on mud and sand by small waves of water. They are most distinct on surfaces where a change of deposit has taken place, as where sandstones alternate with thin clay partings.

ROASTING. A chemical process, by which mineral substances are divided, some of their principles being volatilized, and others changed, so as to prepare them for further operations.

ROBUR CAROLINUM. Royal Oak; a modern southern constellation, consisting of twelve stars.

ROCK. A geological term, denoting the solid parts of the crust of the earth, formed of a single mineral species, or composed of two or more species. One or several rocks united by certain common characters, constitute a *formation,* or connected series; and several formations constitute a *system* of rocks. Rocks have been distinguished, according to peculiarities in their constitution, and in their form and arrangement, into the *Plutonic,* the *Aqueous,* and the *Volcanic.*

1. The *Plutonic Rocks* are primary or primitive in arrangement, igneous in constitution, and unstratified in form.

2. The *Aqueous Rocks* are secondary

and tertiary in arrangement, deposited by water and stratified in form.

3. The *Volcanic Rocks* are of most recent arrangement, composed of volcanic matter, and unstratified in form.

Other classification. Rocks may be arranged into four groups or classes, dependent chiefly upon their relative position. 1. *Granitic Rock*, or those forming the basis or foundation of the rest. 2. *Stratified Rocks*, divided, according to the order of their deposition, into four groups, viz. primary, secondary, tertiary, and alluvial. 3. *Overlying or interjected rocks*, so named because they appear lying over, or interspersed among, the stratified rocks. 4. *Volcanic rocks*, of the same nature as the last, but produced by volcanoes at present or recently in action. The first, third, and fourth classes are all unstratified.

ROCK BUTTER. Alum mixed with alumina and oxide of iron, oozing out of rocks which contain alum.

ROCK CRYSTAL. A pure crystallized variety of quartz, of which the Scotch *cairngorm* is a variety. The purple-coloured rock-crystals are commonly called *amethysts*, and the yellow-coloured have the name of *topazes*. See *Corundum.*

ROCK SALT. Common culinary salt, or chloride of sodium, occurring in vast solid masses or beds, in different formations, extensively in the New Red Sandstone formation, as in Cheshire; in this condition it is called *rock* salt.

ROCK WOOD. A variety of asbestus, of a brown colour, and with the appearance of wood; found in the Tyrol, &c.

RODE'NTIA (*rodo*, to gnaw). *Glires.* An order of Mammalia, in which the jaws are deficient in true incisors, their places being supplied by the canines, which are brought forward, and adapted to gnawing, as in the beaver, the rat, the hare.

ROESTONE. A variety of compact limestone, called Bath-stone, Ketton-stone, Portland-stone, and Oolite; it is used for building, but is porous and apt to moulder away.

ROMA'NZOVITE. A species of garnet, found in Finland.

ROOT. The *square root* of any number, as 16, is a number which, when multiplied by itself, produces 16. The *cube root* of any number, as 27, is a number which, when multiplied by itself twice, produces 27. The *fourth, fifth,* &c. *roots* are numbers which, when multiplied three, four, &c. times, produce the original numbers. The mark $\surd$ is the *radical sign*, or sign of the root, being the first letter of the Latin term *radix*, a root. Hence—

$\sqrt{16}$ is 4; for $4 \times 4 = 16$
$\sqrt[3]{27}$ is 3; for $3 \times 3 \times 3 = 27$
$\sqrt[4]{16}$ is 2; for $2 \times 2 \times 2 \times 2 = 16$.

Root of Equation. In equations the unknown quantities have *particular values*, which are sometimes called the "roots" of the equations, and are said to *satisfy* them. Thus, if $x^2 = 4$, we know that $x = 2$ or -2; and $2, -2$, are called the *roots* of the equation $x^2 = 4$.

ROOT OF PLANTS. The descending part of the axis of plants, or that portion which tends towards the centre of the earth. The main body is called the *caudex*, its minute divisions being called radicles or fibrils. When a root is divided into many fibrils, it is termed a *fibrous* root; when truncated at the extremity, *præmorse;* when it tapers conically downward, it is termed *fusiform*, or tap-rooted. Under the general term root, many parts have been erroneously enumerated, as subterranean stems, the tuber, the cormus, &c.

ROSA'CEÆ. The Rose tribe of dicotyledonous plants. Herbaceous plants and shrubs with *leaves* alternate; *flowers* polypetalous; *stamens* perigynous; *ovaria* superior, solitary, or several; *fruit* 1-seeded nuts, or acini, or follicles containing several seeds.

RÖSCHGEWÄCHS. The name given by the Hungarian miners to the sulphur-salt commonly called *brittle vitreous silver.* It appears to be composed of the same constituent elements as the dark and the bright red ruby-silver ores, but in different proportions.

ROSE or MILK QUARTZ. A sub-species of indivisible quartz, of rose-red and milk-white colours. It is probably silica, coloured with manganese. It occurs in Bavaria in beds of quartz in granite.

ROSELITE. A new mineral of a deep rose colour, found on amorphous greyish quartz in Saxony. It is an arseniate of cobalt, with lime and magnesia.

ROSTRUM. Literally, a *beak;* and hence, applied in Botany to any rigid prolongation of considerable length. *Rostellum*, a diminutive of rostrum, is also employed to denote any small beak-shaped process.

RO'SULATE (*rosa*, a rose). In botanical nomenclature, this term is used to designate parts which are not oppoposite, but which nevertheless become apparently so by the contraction of the joints of the stem, and lie packed closely over one another, like the petals of a double rose, the offsets of houseleek, &c.

ROTA MERIDIA'NA. A *transit circle* erected by Römer at Copenhagen. It was a divided circle set upon a hollow double cone, at right angles to the axis of the cones, and concentric with them, the circle being near one end of the axis. The divisions were read by two microscope verniers, fixed in a diameter of the circle on one of the supports of the axis.

ROTAL ACTION OF AFFINITY. A term applied to the action of chemical affinity, as exhibited in the voltaic circle, in which it assumes a circular direction or return upon itself. It is what has been more commonly called *inductive* affinity, from its analogy to magnetic induction.

ROTATE COROLLA. A wheel-shaped corolla, of which the tube is very short, and the segments spreading, like the radii of a wheel, as in borago.

ROTA'TION (in plants). A special motion of the sap, observed in plants of low organization. It consists in a special circulation of the fluid contained in the interior of each cell, the rotation in one cell never interfering with that in another cell. This phenomenon differs from that of *cyclosis*, which consists in the motion of the *latex* in the cinenchymatous vessels. The two special motions are said never both to occur in the same species.

ROTATORY MOTION (*rota*, a wheel). When the different points of a body move at the same time in different directions, this is called a rotatory motion. *Rotation on an axis* implies, in addition to this rotatory motion, that all the parts of the body revolve round an imaginary right line in a state of rest, called the *axis*. The wheels of any piece of machinery have a rotatory motion round their axes; the diurnal and annual motions of the earth, a rolling ball, the wheels of a waggon as it travels, are illustrations both of direct and of rotatory motion.

ROTELLI'NÆ. Wheel-shells; a subfamily of the *Trochidæ*, named from the genus *rotella;* they are perlaceous, and nearly discoid in shape, with a thickened mass over the inner lip.

ROTI'FERA (*rota*, a wheel, *fero*, to carry). Infusorial animalcules, consisting of minute, transparent, soft, aquatic animals, with distinct muscular and nervous systems, and having the appearance of revolving *wheels*, produced by the rapid motion of the cilia placed round the mouth. They are distinguished into the *loricata*, which have the surface of the body protected by a sheath; and the *nuda*, in which the body is soft and naked.

ROTTEN-STONE. A massive mineral, consisting of alumina, silica, and carbonaceous matter, found near Bakewell, &c., and employed in polishing metals.

RUBBLE. A term applied by quarrymen to the upper fragmentary and decomposed portion of a mass of stone.

RU'BELLITE. Red schorl or tourmaline, found at Rözna in Moravia.

RUBY. A crystallized gem of various shades of red. The *spinelle* ruby is scarlet-coloured; the *balass* ruby is of a pale or rose red; the *rubicelle* is yellowish red. The oriental ruby of jewellers is the red sapphire.

RUBY SILVER ORE. A double sulphur-salt; distinguished into the dark and the light red, both of the same crystalline form, but in the latter of which sulphuret of arsenic takes the place of sulphuret of antimony of the former.

RUDO'LPHINE TABLES. A set of astronomical tables computed by Kepler, and founded on the observations of Tycho Brahé. They were named in honour of Rudolph II., emperor of Bohemia, and were the first tables ever calculated on the hypothesis that the planets move in elliptic orbits.

RUMINANTIA (*rumino*, to chew the cud). An order of the Mammalia, containing the ox, deer, sheep, &c., characterized by their cloven feet, the absence of incisors in the upper jaw, and the complex arrangement of the stomachs by which rumination is effected.

RUMINATED. A term applied to the *albumen* of certain plants, in which it is perforated in various directions by dry cellular tissue, as in the nutmeg, and palmaceous plants.

RUNNER. A prostrate aerial stem, forming at its extremity roots and a young plant, which itself gives origin to new runners, as in strawberry.

RU'PTURING or SOLUBILITY. In Botany, the spontaneous contraction of a portion of the pericarp, by which its texture is broken through, and holes formed for the dispersion of the seeds, as in Antirrhinum and Campanula.

RUTA'CEÆ. The Rue tribe of dicotyledonous plants. Herbaceous plants, with *leaves* alternate, dotted; *flowers* symmetrical; *petals* alternate with the divisions of the calyx; *stamens* hypogynous; *ovarium* entire, celled; *fruit* capsular.

RU'TILE (*rutilus*, red). *Titan-schorl.* Native oxide of titanium.

S

SAC of the EMBRYO. The name given by A. Brongniart to a fifth membrane which sometimes occurs in the ovule of plants. Mirbel calls this the *quintine*, Malpighi the *vesicula amnios*, and R. Brown the *additional membrane.*

SA'CCHARINE MATTER (*saccharum*, sugar). That portion of vegetable substances which is sweet to the taste, or which is capable of becoming sweet under certain circumstances, or by certain manipulations. This, when sufficiently fluid, readily enters into *vinous fermentation*, emits carbonic acid gas, becomes of less specific gravity, and the product is a *vinous liquor*. See *Alcohol.*

SA'CCHAROID (σάκχαρ, sugar, εἶδος, likeness). *Saccharine.* A term applied in Geology to a stone which has the texture of sugar.

SACCHARO'METER (σάκχαρον, sugar, μέτρον, a measure). Literally, a measurer of sugar; an instrument employed in the operations of brewing and of making sugar, its intention being to indicate the density of the liquid extracted from malt and of that from the sugar cane. It acts on the same principle as the lactometer and the hydrometer, and such instruments are sometimes comprehended under the general term *aræometer* or gravimeter.

SAFETY-LAMP. An instrument invented by Davy for preventing the explosion of fire-damp in mines. It consists of a lamp completely surrounded by a cage of fine *wire-gauze*, through which the explosive mixture cannot be fired. So soon as the gas is inflamed within the gauze, the miner is thereby admonished to retire, lest the intense heat of the flame should oxidise the metal, which would then fall to pieces.

SAFETY-VALVE. A valve fitted to an opening in a boiler, and *loaded with a weight* sufficient to withstand the elastic pressure of the steam until it rise to a certain degree, when it would be forced out, and thus prevent the boiler from bursting.

SAGI'TTA. The Arrow; a northern constellation, consisting of eighteen stars.

SAGITTA'RIUS. The Archer; the ninth of the Zodiacal signs, consisting of 69 stars. It denotes the third month of spring, and extends from the 20th of May to the 20th of June. In the Egyptian zodiac the animal is figured with the body of a quadruped and with a double head, one of a lion, the other of an armed man about to discharge an arrow; it seems to drive forward the animals which precede it, and to check those which follow; every thing indicates that it will soon reach the goal towards which it is tending, and that its course is on the point of terminating.

SAH'LITE. A variety of *augite*, in which the magnesia is only in part replaced by protoxide of iron. Berzelius calls it *malacolite.* It occurs in the silver mine of Sahla in Sweden.

SAILING, or the SAILINGS. These terms are applied to the different ways in which the path of a ship at sea and the variations of its geographical positions are represented on paper. They are also occasionally applied to the rules by which, in particular circumstances, a ship's place and its motion are computed.

1. *Plane Sailing.* This consists in representing the line of a ship's course or way, for a given time, with the difference between the latitudes and between the longitudes of the two extreme points of such course by the three sides of a right-angled plane triangle, of which the distance actually sailed is the hypotenuse; the spaces on all the lines being expressed in nautical miles or equatorial minutes of a degree, as if the earth were a plane surface and the terrestrial meridians and parallels of latitude were straight lines respectively parallel to each other.

2. *Middle-latitude sailing.* This term and that of *globular sailing* have been briefly explained in their alphabetical positions. The latter is a general term for several modes of sailing, in which the

rules of computation are founded on the hypothesis that the earth is a sphere.

3. *Parallel sailing.* The term denotes the course of a ship sailing in a direction either due east or due west, so as to sail on the circumference of a parallel of latitude. The determination of the ship's place is obtained by knowing that, on the globe, the length of a degree of a meridian bears the same proportion to the length of a degree of a parallel, as the radius to the cosine of the latitude in which that parallel is situated.

4. *Mercator's sailing.* In this mode of sailing, the earth's surface is supposed to be projected on a plane, as on a Mercator's chart (See *Projection*), in which the meridians and parallels of latitude are respectively parallel to themselves. The ship's place is then determined by the fact that the lengths of infinitely small portions of the circumference of the equator have to the lengths of corresponding portions of a meridian, in any latitude, the ratio that the radius bears to the secant of that latitude.

5. *Great-circle sailing.* This consists in determining a series of points in an arc of a great circle between two points on the surface of the earth, for the purpose of directing a ship's course as nearly as possible on such arc; that is, on the curve of shortest distance between the place from which she sets out and that at which she is to arrive.

6. *Traverse sailing.* This is a general term for the determination of a single course equivalent to a series of successive courses, whatever be the manner of finding the lengths of the lines forming the triangles.

7. *Oblique sailing.* This consists in determining the position of a ship by observing with a compass the bearings of two or more objects on the shore, whose places are given on a chart, and drawing lines from those places so as to make angles with their meridians equal to the observed bearings: the intersection of the lines gives on the chart the position of the ship. This is sometimes called the method of *cross bearings.*

8. The term *oblique sailing* is also applied to any problem in which (when the triangles are not right-angled) the distance of the ship from any object on the shore, or of such objects from one another, is computed by the rules of plane trigonometry from bearings observed at the ship when the latter is at two or at a greater number of stations.

9. *Current sailing.* This is the method of determining the true motion of a ship when, besides being acted upon by the wind, she is moving in a current.

10. *Windward sailing.* A term applied to that mode of navigating a ship in which the latter endeavours to gain a port situated in the direction whence the wind is blowing. The ship in this case is made, by frequent tacking, to sail as near as possible to the wind.—*Pen. Cycl.*

SAL AMMONIAC. *Salmiac.* Muriate of ammonia. The native salt is of two kinds, the *volcanic*, and the *conchoidal;* the former consisting of sal ammoniac and muriate of soda, and found in volcanic districts; the latter consisting of sal ammoniac and sulphate of ammonia, found, it is said, in beds of clay slate. *Secret sal ammoniac* is sulphate of ammonia, and was so named by its discoverer Glauber.

SAL PRUNELLA. Nitrate of potash, fused and cast into cakes or balls.

SALAMA'NDRIDÆ. A family of Batrachians, comprising the salamander, the newts, and other species of long-tailed caducibranchiate reptiles, or those which lose their gills before they arrive at maturity, but retain their tails.

SALICACEÆ (*salix*, the willow). The Willow tribe of Dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* achlamydeous, amentaceous; *ovarium* superior, 1 or 2-celled; *fruit* coriaceous; *seeds* indefinite, comose.

SALICARIÆ. The Loosestrife tribe of Dicotyledonous plants. Herbs with *leaves* opposite, entire; *flowers* polypetalous; *calyx* tubular; *stamens* perigynous; *carpella* concrete; and a superior ovarium with several cells.

SA'LICYL. The hypothetical radical of salicylous and salicylic acids, and some other compounds. It was viewed by Dumas as a higher degree of oxidation of benzoyl.

SALIENT ANGLES (*salio*, to jump or bound forward). The prominent angles in a zigzag line, which alternate with the reversed or re-entering angles. The term is frequently used in fortification, but seldom in geometry.

SALI'FEROUS SYSTEM (*sal*, salt, *fero*, to bear). A geological term applied to the series of calcareous, argillaceous, and sandy strata, which produce rock salt or brine springs, and gypsum. The series is also termed New Red Sandstone, from the prevalence of the red colour; and Poikilitic System, from the varied colours of its rocks.

SALIFIABLE BASE (*sal*, a salt, *fio*, to become). A substance which forms definite compounds with an acid, and which, when liquid, or in a state of solution, has an alkaline reaction. The acid, of whatever kind, was denominated by Lavoisier, the *salifying principle.*

SALMO'NIDÆ (*salmo*, the salmon). The Salmon and Trout tribe; a family of *Malacopterygious* or soft-spined fishes, distinguished by the fatty deposition in the dorsal fin, from part of which the spines often disappear.

SA'LPIANS. An order of the tunicated *mollusca*, which float in the open sea, and are characterized by their transparent elastic outer tunic, which is elongated, compressed, and open at both extremities. The order is named from a kind of fish called *salpe.*

SALT. A general term in Chemistry for a combination of binary compounds with each other, as of sulphuric acid with soda in Glauber's salt; such a combination is called a *ternary* compound, and it is thus distinguished from *binary* compounds, in which one element is combined with another element; and from *quaternary* compounds, in which salts or double salts, such as alum, are combined together.

1. *Nomenclature of Salts.* Salts are named according to the acid they contain, the termination *ic* of the acid being changed into *ate*, and that of *ous* into *ite.* Thus a salt of sulphuric acid is a *sulphate;* of sulphurous acid, a *sulphite;* &c., and the name of the oxide indicates the species, as the sulphate of the oxide of silver, or simply the sulphate of silver, the oxide of the metal being always understood.

2. A *super*-sulphate contains a greater proportion of acid than the sulphate or neutral sulphate; a *bi*-sulphate twice as much, and a *sesqui*-sulphate once and a half as much as the neutral sulphate; while a *sub*-sulphate contains a less proportion than the neutral salt; the prefixes referring in all cases to the proportion of acid in the salt, or to the *electro-negative* ingredient, as in the case of oxides.

3. The excess of base in sub-salts is sometimes indicated by Greek prefixes expressive of quantity, as *di*-chromate of lead, *tris*-acetate of lead; but this deviation from rule is apt to lead to confusion. If a precise expression for such sub-salts were required, it would be better to say, the bibasic subchromate of lead, the tribasic subacetate of lead. But the names of both acid and basic salts are less in accordance with correct views of their constitution, than the names of any other class of compounds. —*Graham.*

SALT SPRINGS. Springs of water containing a large quantity of common salt. They abound in Cheshire and Worcestershire, and culinary salt is obtained from them by mere evaporation.

SALTATO'RES (*salto*, to leap). A family of Spiders which make no web, but spring upon their prey by insidious and agile leaps.

SALTATO'RIA (*salto*, to leap). A family of *Orthopterous* insects, in which the thighs of the hind legs are much larger than the rest, by which they possess great powers of leaping. They include the crickets, grasshoppers, locusts, &c. See *Cursoria.*

SALTPETRE. *Sal petræ.* Nitre, or the nitrate of potash. It occurs native as efflorescence, mixed with other nitrates, and as crystalline crusts.

SA'MARA. The botanical designation of a two or more-celled superior fruit, bordered by wing-like expansions, as in sycamore.

SAME. This term, as well as "One," "Identical," and their derivatives, is ambiguous, and has led to much error in philosophy. In its primary sense it denotes *identity*, and does not admit of degrees; in its secondary sense it is employed to denote great *similarity*, and, in popular usage, admits of degrees, as when we speak of two things being *nearly* the same, but not entirely. To this ambiguity Whately refers much of the error of Realism; of Plato's theory of Ideas; of the personifications and deifications in poetical mythology; &c.

SA'NDIVER. *Glass gall.* A saline substance, which rises as a scum in vessels employed in the manufacture of glass.

SANDSTONE. Any stone which is composed of agglutinated grains of sand, whether calcareous, siliceous, or of any other mineral nature. The chief ingredient of *sand* is granular quartz or flint.

SA'NIDINE. Glassy felspar; this, and ice-spar, are substances nearly allied to common felspar.

SAP. The *ascending* limpid juice of plants, as distinguished from the descending or elaborated juice.

SAPO'NIFICATION (*sapo*, soap, *fio*, to become). The conversion of any substance into soap.

SAPPHIRE. A variety of rhomboidal corundum, constituting the ruby and the oriental topaz.

SA'RCOCARP (*σὰρξ*, *σαρκὸς*, flesh, *καρπὸς*, fruit). The name given by some botanists to the parenchyma, or fleshy part of fruits, lying between the epicarp or skin, and the endocarp or stone. See *Pericarp*.

SA'RCODERM (*σὰρξ*, *σαρκὸς*, flesh, *δέρμα*, skin). A term applied by De Candolle to the substance which occurs between the integuments of the seed, analogous to the sarcocarp of fruits.

SARCO'PHAGA (*σὰρξ*, flesh, *φάγω*, to eat). Flesh-eating animals; a term synonymous with the more usual one *zoophaga*, and, like this, employed in contradistinction to that of *phytophaga*.

SARD, or SARDOIN. A variety of chalcedony, of a brownish yellow colour, said to be found in Sardinia.

SA'RDONYX. A variety of onyx, in which the opaque white alternates with a rich deep orange brown of considerable translucency. The name is said to be derived from that of Sardes, in Lydia, whence the stone was brought. By others it is referred to Sardo, the Greek name of Sardinia, whence the Carthaginians are said to have exported it.

SARGA'SSO. The *fucus natans*, or gulf-weed, which is spread over a considerable part of the surface of the Atlantic, beginning on the east at the 30th meridian, and extending on the west to the Bahama Islands. Its northern limit may be placed at 36° N. lat., and its southern at 19° N. lat. The abundance of this weed has led to the Portuguese expression of *Mar de Sargasso*, or Weedy Sea.

SARME'NTUM. The name given by some botanists to the modification of the aërial stem called a *runner*.

SAROS. A Chaldean name applied, according to some writers, to an astronomical period of 18 years and 10 or 11 days, according as the 18 years have 5 or 4 leap-years. Berosus, however, speaks of the saros of 3600 years. It is, probably, not a chronological period, but only a portion of time with any arbitrary commencement.

SA'SSOLINE. Native boracic acid, found on the edges of hot springs near Sasse, in the territory of Florence.

SA'TELLITE (*satelles*, a life-guard). A secondary planet, or moon, so named from its attending a primary planet, as a prince is attended by his satellites or life-guards. See *Planet*.

SATIN SPAR. A fibrous limestone with a pearly lustre, from Cumberland. It consists chiefly, if not entirely, of carbonate of lime.

SATURA'TION (*saturo*, to satisfy). In the language of Chemistry, a fluid is said to be *saturated* with a substance, when it holds as much of this substance in solution as it can dissolve. Thus, water is said to be saturated with common salt, when it has dissolved about one-third of its weight of the latter: it will not dissolve any more.

Again: when two principles, which have united to form a new body, are in such proportion that neither predominates, they are said to be *saturated* with each other, or the affinities are said to be satisfied. If otherwise, the predominant principle is said to be *sub-saturated*, or under-saturated, and the other *super-saturated*, or over-saturated.

SATURN. A planet 900 times larger than the earth, revolving on its axis in 10½ hours, and performing its orbit round the sun in twenty-nine years, five months, and fourteen days. It is accompanied by eight satellites, and is surrounded by two luminous rings.

SAU'RIANS (*σαύρα*, a lizard). An order of Reptiles, in which the ribs are moveable, and there are one or two pairs of external members. It comprehends all the lizard tribe, which are intermediate between the Loricata and the Serpents.

SAU'ROID FISHES (*σαύρα*, a lizard, *εἶδος*, resemblance). A tribe of fishes, exhibiting strong saurian or reptilian analogies, chiefly in the teeth. The existing sauroid fishes consist of seven species only, five belonging to the genus *lepidosteus*, or bony pike, and two species of *polypterus*, one from the Nile, the other from the Niger.

SAU'SSURITE. *Axe-stone; jade.* A mineral found by Saussure on the borders of the lake of Geneva, consisting principally of silica and alumina with oxide of iron.

SAVANNA or PRAIRIE. The name given to the vast plain constituting the central part of North America, from the Frozen Ocean to the Gulf of Mexico, watered by the Missouri and the Mississippi. This immense tract of country is estimated at 2,430,000 square miles.

SAXICA'VIDÆ (*saxum*, a stone, *cavo*,

to hollow out). A family of the macrotrachian bivalves, named from the genus *saxicava;* the inhabitants of these shells are perforating animals, as the name denotes.

SAXICOLI'NÆ (*saxum*, a stone, *colo*, to inhabit). Saxicoline birds, or Stonechats; a family of the Cantatrices of Macgillivray. Being intimately allied to the Turdinæ, Alaudinæ, and Sylviinæ, they present no abrupt and decided characters by which they can be easily defined. Most of them are migratory.

SAXONY BLUE. An intensely deep blue, imparted by dyeing with sulphate of indigo.

SCAGLIO'LA (*scaglia*, Ital., a scale). An artificial composition employed for making columns, and consisting of pure gypsum, Flanders glue, isinglass, &c.

SCALE (*scala*, a ladder). A line divided into a marked number of small and equal parts, applied as a measurer of other lengths which are not so divided, in order to ascertain their relative dimensions.

Plane diagonal decimal scale. This instrument consists of a ruler divided into a certain number of equal parts, and these parts, by a particular contrivance, are again subdivided *decimally*, or into tenths and hundredths of these parts. By this instrument we are enabled, though with no great degree of accuracy, to draw lines which shall bear to each other nearly any proportions we may please to assign them.

SCALE OF NOTATION. A system of notation in which each figure of a number increases its value in a certain proportion in proceeding from right to left. The number, according to whose powers the values proceed, is called the *radix* of the scale. This number is conventional, and there may, consequently, be any number of different *scales*, each of which has its own radix. When the *radix* is 2, the *scale* is called *binary;* when 3, *ternary;* when 10, *denary*, or *decimal;* when 12, *duodenary*, or *duodecimal;* &c.

SCALE'NE (σκαληνὸς, unequal). A geometrical term applied to a triangle which has three unequal sides.

SCANSO'RES (*scando*, to climb). *Scandrices.* Climbers; a group of birds, so named from their great facility in climbing the branches of trees, including the woodpeckers, the cuckoos, the toucans, and the parrots. The external toe is turned backward, as well as that which is posterior in the Rasores, so that they have two posterior and two anterior toes.

SCAPE. A botanical term denoting that form of inflorescence, in which the axis of stemless plants proceeds immediately from the ground, or near it, as in cowslip.

SCA'PHITE (σκάφος, a boat). A genus of fossil cephalopods, of a boat-like form.

SCA'POLITE (σκάπος, a rod, λίθος, a stone). Pyramidal felspar; a substance now classed under the general name *Wernerite.* Scapolite is divided by Jameson into four sub-species, viz. radiated, foliated, compact red, and elaolite.

SCARABÆ'IDÆ (*scarabæus*, a beetle). A large group of beetles constituting the principal part of the section Lamellicornes. They are distinguished from the other section, or the *Lucanidæ*, chiefly by the structure of their antennæ, which are proportionately shorter.

SCA'RBROITE. Hydrated silicate of alumina, occurring in veins in the beds of sandstone covering the calcareous rock near Scarborough, between septa of oxide of iron.

SCARI'TIDÆ. A family of Coleopterous insects, belonging to the section Geodephaga, and named from the genus *scarites.*

SCELIDOTHE'RIUM (σκελὶς, the thigh, θηρίον, a beast). An animal of the megatheroid type, exhibiting a transition to the ant-eater and armadillo, which it resembles more than the sloth in the form and structure of the skull.

SCHAALEN BLENDE. Testaceous blende; a sulphuret of zinc, containing iron and lead. The most characteristic specimens are found at Geroldseck in the Brisgau.

SCHAALSTEIN. Tabular spar or table spar; a silicate of lime, occurring in primitive rocks, where it is associated with brown garnets. This is the prismatic augite of Jameson.

SCHAUM EARTH. Aphrite, or earth foam; a carbonate of lime, occurring usually in a friable, but sometimes in a solid state, with a shining lustre, between semi-metallic and pearly.

SCHEAT. A star of the third magnitude in the constellation Aquarius.

SCHEELE'S GREEN. Arsenite of copper; a green pigment.

SCHEE'LIUM. Pyramidal tungsten; an ore of tungsten, named from Scheele, its discoverer. *Scheelite* is a tungstate of lime; *scheel-lead ore*, a tungstate of lead, formerly confounded with the molybdate of this metal.

SCHELLING'S PHILOSOPHY. A system of philosophy, which teaches the identity, or *indifference*, of the ideal and the real. It was propounded by Schelling about thirty years ago, and appears to be directly opposed to the philosophy of Kant.

SCHERBEN COBALT. *Testaceous cobalt.* Names formerly given to native arsenic. It occurs in reniform and botryoidal shapes at Andreasburg, &c.

SCHE'RERITE. A species of combustible mineral found in a bed of brown coal in Switzerland. It seems to be a mineral naphthaline: its constituents are, hydrogen, 24; carbon, 73.

SCHIEFER SPAR. *Slate spar.* A sub-species of limestone, also called foliated carbonate of lime.

SCHILLER SPAR. A mineral substance, constituting a variety of *asbestine;* it is also called metalloid diallage or diallagite. It contains two sub-species, viz., bronzite and common schiller spar. The term is derived from the German *schillern*, to change colours, and indicates the changeable hues of the mineral.

SCHIST (*schistus*, that which may be split). A term often used synonymously with slate; but it may be very useful to distinguish between a schistose and a slaty structure. The hypogene or primary *schists*, as they are termed—as gneiss, mica-schist, and others—cannot be split into an indefinite number of parallel laminæ, like rocks which have a true slaty cleavage. The uneven schistose layers of mica-schist and gneiss are probably layers of deposit which have assumed a crystalline texture.

SCHISTOSE ROCKS. Rocks which have the character of schist. See *Schist.*

SCHI'ZOPODS (σχίζω, to cleave, ποὺς, a foot). A tribe of long-tailed decapod crustaceans, the legs of which are accompanied by an external articulated branch as long as the limbs, which thus appear double in number. The *mysis*, or opossum shrimp, is an illustration of the tribe.

SCHMELZSTEIN. Another name for *dipyre*, under which name the characters of this mineral are noticed.

SCHO'LIUM (σχόλιον, a comment). A remark or observation. In Geometry, a scholium is a note or observation on a proposition not containing any inference, or, at least, none of sufficient importance to entitle it to the name of *corollary*.

SCHORL (*scorl*, Swed., brittle). Common schorl is a sub-species of rhomboidal tourmaline, consisting chiefly of silica, alumina, and oxide of iron, and occurring imbedded in granite, gneiss, &c. *Blue schorl* is a variety of Haüyne. *Red* and *Titanitic schorl* are names of rutile, an ore of titanium. *Schorl rock* or *schorly granite* is a rock in which crystals of schorl are added to the usual ingredients of granite; or when quartz and schorl only occur, the felspar and mica having disappeared.

SCHORLITE, or SCHORLOUS TOPAZ. *Pycnite* of Werner. A mineral consisting of alumina, silica, and fluoric acid, occurring at Altenberg in Saxony, in a rock of quartz and mica in porphyry.

SCHRIFTERTZ. *Graphic tellurium;* a combination of tellurium with silver and gold.

SCIÆNOIDS. A family of acanthopterygian fishes, nearly allied to the Percoids, and named from the genus *sciæna.*

SCIÆNU'RUS. A genus of fossil fishes, representing the perch and other allied forms. Its remains are very common in the London clay of Sheppey.

SCIENCE (*scientia*, knowledge). This term, in its most comprehensive sense, only means *knowledge;* in its ordinary sense it denotes *knowledge reduced to a system;* that is, arranged in a regular order, so as to be conveniently taught, easily remembered, and readily applied.

SCINCO'IDÆ. The Skink tribe, or Serpent Lizards; a family of Saurian reptiles, characterized by the shortness of their feet, the roundness of their body, and the equality of the tile-like scales with which their body is covered.

SCITAMINEÆ. The Ginger tribe of monocotyledonous plants. Herbaceous plants with a creeping, often-jointed, *rhizome; leaves* simple, sheathing; *flowers* tripetaloideous; *stamens* 3, distinct; *ovarium* 3-celled; *fruit* capsular, 3-celled, many-seeded: *seeds* with or without an arillus.

SCIU'RIDÆ (σκίουρος, a squirrel; from σκιὰ, shade, and οὐρὰ, a tail). The Squirrel tribe; a family of the Rodentia, comprising the squirrels, marmots, dormice, &c., characterized by long, bushy tails, and their adaptation to a residence in trees.

SCLERODE'RMI (σκληρὸς, hard, δέρμα, skin). A family of *Plectognathous* fishes, characterized by their very hard and granulated skins. The roughness of the skin in some of the species has suggested the common term of *file-fishes.*

SCLE'ROGEN (σκληρὸς, hard, γεννάω, to produce). The matter of lignification which is deposited on the inner surface of the cells of plants, contributing to their thickness.

SCO'LIADÆ. A family of fossorial hymenopterous insects, named from the genus *scolia.*

SCOLOPA'CIDÆ (*scolopax,* the woodcock). The Snipe tribe; a family of the *Grallatores,* or Wading birds, characterized by their long, slender, and feeble bill.

SCOLYMI'NÆ. A sub-family of the *Turbinellidæ,* or Turnip-shells, named from the typical genus *scolymus,* and characterized by a ponderous and rough shell, with foliated spines or tubercles.

SCOMBE'RIDÆ (*scomber,* the mackerel). The Mackerel tribe; a family of the *Acanthopterygious* or spiny-finned fishes, including the mackerel, tunny, sword-fish, dory, dolphin, &c.

SCO'PIPEDS (*scopæ,* a brush, *pes,* a foot). A tribe of melliferous insects, including those which have the tarsi of the posterior feet furnished with a brush of hairs.

SCORIÆ (σκωρία, from σκῶρ, excrement). The scum or dross of metals; the refuse or useless part of any substance; volcanic cinders; &c.

SCO'RPIO. The Scorpion; the eighth of the zodiacal constellations, consisting of forty-four stars, the principal of which is Antares. It denotes the second month of spring, extending from the 20th of April to the 20th of May. The heat of this month stimulates venomous reptiles, and excites disease and pestilence.

SCREW. One of the mechanical powers. It may be considered as an inclined plane wrapped round a cylinder, or as a cylinder having on its surface a projecting thread inclined in all parts at the same given angle to the horizon. The cylinder fits into a block pierced with an equal cylindrical aperture, on the inner surface of which is cut a groove, the exact counterpart of the thread on the screw; hence we can cause the screw to enter the block by merely making it revolve about its axis.

Endless Screw. The force of the screw is sometimes employed to turn a wheel, by acting on its teeth, the thread of the screw passing between the teeth or cogs of the wheel. In this case it is called a *perpetual* or *endless screw.*

SCROPHULARIA'CEÆ. The Figwort tribe of Dicotyledonous plants. Herbaceous plants with *leaves* opposite; *flowers* irregular, unsymmetrical; *stamens* 2 or 4, didynamous; *fruit* capsular; *seeds* albuminous.

SCURF OF PLANTS. A term applied in Botany to the thin, flat, membranous disks, with a ragged margin, formed of cellular tissue, springing from the epidermis of plants. They are distinguished into *scurf,* properly so called, and *ramenta.*

SCUTE'LLUM (dim. of *scutum,* a shield). *Apothecium.* The botanical designation of the little coloured cup or disk, found in the substance of lichens; it is surrounded by a rim, and contains the *asci,* or tubes filled with sporules.

SCUTIBRANCHIA'TA (*scutum,* a shield, *branchiæ,* gills). An order of gasteropods which have pectinated gills disposed in a special cavity, with shells which are very wide, scarcely ever turbinated, and cover the body and gills, like a shield.

SCU'TIPEDS (*scutum,* a shield, *pes,* a foot). The name given by Scopoli to those birds which have the anterior part of the leg covered with segments of unequal horny rings terminating on each side in a groove.

SCUTUM SOBIESKI. Sobieski's shield; a modern northern constellation, consisting of eight stars.

SCYLLA'RIANS. A tribe of macrurous decapods, established by Milne Edwards on the genus *scyllarus* of Fabricius, and forming one of the most remarkable groups, distinguished at the first glance by the singular conformation of the external antennæ. It comprises the genera Scyllarus, Thenus, and Ibacus.

SEA. A portion of the ocean which penetrates into a continent by a narrow passage, and then spreads into a large expanse, as the Mediterranean sea. The term is, however, frequently employed in a larger sense to denote the whole volume of water which occupies the lower portion of the surface of our globe, or three-fourths of its entire superficies; in this sense it is synonymous with *ocean.*

SEA WAX. Maltha; a white, solid,

waxy-looking fusible substance, found on the Baikal lake in Siberia.

SEAMS. Thin layers which separate two strata of greater magnitude.

SEASONS OF THE YEAR. The four quarters of the year, commencing,—the first, or Spring quarter, when the sun enters Aries; the second, or Summer, when he enters Cancer; the third, or Autumn, when he enters Libra; the fourth, or Winter, when he enters Capricorn. The variety of the seasons depends on the uniform direction of the axis of the earth; this is always carried round parallel to itself, and pointing always to the same vanishing point in the sphere of the fixed stars.

SEBA'CIC ACID (*sebum*, lard). An acid obtained from the oleic, or from any of the fats which contain this acid. Its salts are called *sebates.*

SECANT (*seco*, to cut). A line which cuts another line. In trigonometry, it is a straight line drawn from the centre of a circle to one extremity of an arc, and produced until it meets the tangent to the other extremity. The secant of an arc is a third proportional to the cosine and the radius; hence, if the radius be taken as unity, the secant is the reciprocal of the cosine. See *Trigonometry.*

SECOND. The sixtieth part of a minute, in calculations either of time or of angular measure. See *Hour.*

SECOND (in Music). An interval producing a discord, the ratio of which is 9 : 8. There are three kinds of second, the minor or semitone, as EF; the major, or CD; and the extreme sharp second, as CD♯.

SECONDARIES. *Secondary circles.* In Astronomy, all those circles on the sphere which intersect a primary circle at right angles, passing through the axis and the poles, are called *secondaries.*

SECONDARY STRATA. An extensive series of the stratified rocks which compose the crust of the globe, with certain characters in common, which distinguish them from another series below them called *primary*, and from a third series above them called *tertiary.*

SECRE'TION (*secerno*, to separate). A general term for that function in animal and vegetable physiology, by which certain products are *secreted* or separated from the circulating fluid,—from the blood in animals, from the sap in plants. The same term is also applied to the products so secreted or separated. Thus, the liver secretes bile, and bile is called the secretion of the liver; the tuber secretes starch, and this is termed a secretion of the tuber.

SECTOR (*seco*, to cut). A sector of a circle is the figure contained by two radii and the arc between them; it thus differs from a *segment*, which is included by an arc and its chord. A sector with a right angle is a fourth part of a circle, and its arc is called a "quadrant." The term *sector* is also applied to a mathematical instrument, the purpose of which is to facilitate the graphical determination of proportional quantities; hence it is termed by the French the *compass of proportion.*

SECTOR, ZENITH. A peculiar modification of the altitude and azimuth instrument. It is adapted for the very exact observation of stars in or near the zenith, by giving a great length to the vertical axis, and suppressing all the circumference of the vertical circle, except a few degrees of its lower part, by which a great length of radius, and a consequent proportional enlargement of the divisions of its arc, are obtained.

SECULAR and PERIODIC. In Astronomy, any deviation from the mean motion or mean orbit of a celestial body is called an *inequality*, and the numerical expression of the magnitude and period of the inequality is called an *equation*. An equation of this kind is said to be *periodic*, when the motions it expresses perform their changes in a comparatively short period of time; *secular*, when the changes are so gradual as to be insensible only after the lapse of centuries. Thus, the lunar evection is a *periodic*, the acceleration of the moon's mean motion, a *secular* inequality.

SECULAR REFRIGERATION (*sæculum*, an age). The periodical cooling and consolidation of the globe from a supposed original state of fluidity from heat.

SECUNDINE. The name given by botanists to that sac of the ovule which reposes immediately upon the *primine*, and often contracts an adhesion with it, so that the two integuments become confounded. Its point is usually protruded beyond the foramen of the primine.

SEDIMENTARY ROCKS. Rocks which have been formed by their materials having been thrown down from a state of suspension or solution in water.

SEED OF PLANTS. The *seed* of a plant is the *ovule* in its matured state; it is then a body, enclosed in a pericarp, clothed with its own integuments, and containing the rudiment of a future plant. It is the point of development at which vegetation stops, and beyond which no increase, in the same direction with itself, can take place.

SEGMENT (*seco*, to cut). That part of a circle which is contained by a straight line and the circumference it cuts off. 1. The *angle of a segment* is that which is contained by the straight line and the circumference. 2. An *angle in a segment* is the angle contained by two straight lines drawn from any point in the circumference of the segment to the extremities of the straight line which is the base of the segment. 3. *Similar segments of a circle* are those in which the angles are equal, or which contain equal angles.

SELA'CHII. The Shark and Ray tribe; an order of *Chondropterygious* or cartilaginous fishes, distinguished by the peculiar conformation of the mouth, the jaws not being united into a ring, and the true jaw-bones not being developed. Several of the species are viviparous.

SE'LENITE (σελήνη, the moon). *Sparry gypsum.* A simple mineral, consisting of pure gypsum, or sulphate of lime.

SELENIUM (σελήνη, the moon). A metal discovered in the sulphur of Fahlun, and named from its strong analogy to another metal, *tellurium*, which is named from *tellus*, the earth. It combines with oxygen, forming the *selenious* and *selenic* acids.

SEMI-. A Latin prefix, derived from *semis*, half, and corresponding with the term *hemi* in Greek compounds.

1. *Semi-amplexicaul.* Half stem-embracing; as applied to the leaves of plants which partially sheath the stem.

2. *Semi-anatropous.* A term denoting the same as *amphitropous*, except that in the former the ovule is parallel with the funiculus, while in the latter it is at right angles with it.

3. *Semi-circle.* Half a circle; a figure contained by a diameter of a circle, and the portion of the circumference cut off by the diameter.

4. *Semi-diameter.* Half a diameter, or a right line drawn from the centre of a circle, or sphere, to its circumference; it is otherwise called a radius.

5. *Semi-flosculous.* A term applied to the ligulate, or strap-shaped, florets of some of the compositæ, as of dandelion; in this and similar plants, the limbs of the cohering petals are united on one side of the floret, giving it the appearance of *half a floret.*

6. *Semi-metals.* A term formerly applied to those bodies which possess the qualities of metals, with the exception of malleability.

7. *Semi-opal.* A variety of opal, of white, grey, and brown colours; sometimes in spotted, striped, or clouded delineations; occurring in porphyry and amygdaloid.

8. *Semi-quadrate* or semi-quartile. An astrological term denoting an aspect of the planets when distant from one another half a right angle, or 45°. The terms *semi-quartile* and *semi-sextile* have similar meanings, the former denoting the *half of a fifth* of the complete circle, or 36°, the latter the *half of a sixth*, or 30°.

9. *Semi-tone.* An interval in music whose ratio is 16 : 15, as CC♯. It cannot correctly be called *half a tone*, as there are different kinds of semitones, greater, lesser, and natural.

SENECTI'NÆ. Sea-snails; a subfamily of the *Trochidæ*, named from the genus *senectus*, resembling the garden snail in form, but perlaceous, and furnished with a thick, round, fleshy operculum.

SEN'SIBLE (*sentio*, to perceive). A vague term applied indifferently to a body capable of receiving, of producing, or of conducting sensation. It has been suggested that the term *sentient* should be applied to the first of these cases, and *sensitive* to the third. In the fourth and most ordinary acceptation of the word sensible, it is used to express the state of the intellectual powers.

SE'PAL. The botanical designation of each of the leaves composing the calyx, or external envelope of the floral apparatus. When the leaves are distinct from one another, the calyx is termed *poly-sepalous;* when they cohere, it is called *gamosepalous*, or, incorrectly though popularly, *mono-sepalous.* A sepal may be hollowed out into a conical tube, as in larkspur, and is then said to be *spurred.*

SE'PIADÆ (*sepia*, the cuttle-fish). A family of cephalopods, vulgarly known as *cuttle-fish* , and divisible into two groups, the octopods and the decapods.

SEPTA'RIA (*septum*, a division). *Ludi Helmontii.* Flattened balls of stone, generally a kind of iron-stone, which, on being split, are found to be separated in their interior into irregular masses. From these septaria is manufactured the material for building under water, known as Parker's or Roman cement.

SEPTICI'DAL (*septum*, a division, *cædo*, to cut). That kind of dehiscence of fruits, in which the septa separate each into two laminæ, as in rhododendron. Formerly, botanists used to say that in this sort of dehiscence the valves were alternate with the dissepiments, or that the valves had their margins turned inwards.

SEPTI'FRAGAL (*septum*, a division, *frango*, to break). That kind of dehiscence of fruits, in which the backs of the carpels separate from the septa, which adhere to the axis, as in convolvulus.

SERIES. In Mathematics, a series is a set of terms, finite or infinite in number, connected together by addition or subtraction, and formed upon some distinct law. An *arithmetical series* is one in which each term differs from the preceding by the addition or subtraction of a constant number or quantity; a *geometrical series* is one in which each term is a multiple of the preceding by a constant factor.

1. *Series, infinite.* A series of terms proceeding according to some law, and continued without limit. The *sum* of an infinite series is the *limit* to which we approach more nearly by adding more terms, but which cannot be exceeded by adding any number of terms whatever.

2. A *convergent* series is one which has a *sum* or *limit*, as above defined; a *divergent* series is one which has no such sum or limit. Hence, every infinite series in Geometrical progression, in which the common ratio is less than 1, is *convergent*.

3. *Series, recurring.* If each succeeding term of a decreasing infinite series bear an invariable relation to a certain number of the preceding terms, the series is called a Recurring Series, and its sum may be found. Thus $a + (a + 1) x + (2a + 2) x^2 + (3a + 3) x^3 + (5a + 5) x^2 + \dots$ is a recurring series, the co-efficient of each term being the sum of the co-efficients of the two preceding terms.

4. An *exponential series* is one whose terms depend on exponential quantities; a *logarithmic series* is one whose terms depend on logarithms; and a *circular series*, one whose terms depend on circular functions, as sines, co-sines, &c.

5. The *general term of a series* is a function of some indeterminate quantity x, which, on substituting successively the numbers 1, 2, 3, &c., for x, produces the terms of the series.

SERPENS. A northern constellation, consisting of sixty-four stars. Mythologically, it is the serpent carried by Serpentarius, the serpent-bearer.

SERPENTARIUS. *Ophiuchus.* A northern constellation, containing seventy-four stars, the principal of which is Ras Aliagus.

SER'PENTINE. A rock of the primary series, closely related to diallage rock, of irregular form and of various colours: when opaque, it is named common serpentine; when translucent, noble or precious serpentine. It consists of hydrate of magnesia with subsilicate of magnesia. The name is derived from its frequent contrasts of colour, like those of the skin of some serpents.

SERPU'LEANS. A family of cephalobranchiate annellides, inhabiting cylindrical and tortuous calcareous tubes; generally parasitic on shells.

SERRICORNES (*serra*, a saw, *cornu*, a horn). A family of the pentamerous coleoptera, distinguished by the serrated or toothed form of the antennæ. They have four palpi, and the body is completely covered by the elytra, or wing-cases.

SE'RTULUM. A term applied by some botanists to the simple umbel, the latter term being by them restricted to the compound form of this inflorescence.

SESQUI- (contracted from *semisque*, and a half). A prefix to certain words, denoting so much and half so much, the whole of a thing and a half more. It is used in chemical language when the elements of an oxide are as 1 to $1\frac{1}{2}$, or as 2 to 3. The sulphurets, carburets, &c., of the same substance are similarly designated. Hence, also, the word *sescuplum* (quasi sesqui-plum, from *sesqui* and *plica*, a fold); thus *sescuplo*-carburet, one and a half-fold carburet.

Sesqui-duplicate. A term sometimes found in treatises on Geometry, signifying the ratio in which the greater term is twice and a half times the less; as the ratio of 10 to 4; of 15 to 6; &c.

SESSILE (*sessilis*, sitting). Destitute of any support or peduncle, as a leaf which has no stalk, or the shell of the anomia. The term *Sessiles* has been adopted for a division of the Cirrhopoda, comprehending those species which are not suspended by a pedicle.

SET OF CURRENT. The direction of a current is called its *set;* a current which flows *towards* the NNW. quarter, is said to set NNW. The velocity of a current is called its *drift.*

SETA. Literally, a bristle; hence applied to the bristle-like stalk which supports the theca of mosses; and, hence, the epithet *setose* denotes a surface covered with short, stiff hairs, as the leaf of bugloss, the pappus of some composite plants, &c.

SEVENTH. In Music, a dissonant interval, of which there are three kinds, the minor or ordinary seventh, from G to F; the diminished seventh, from C sharp to B flat; and the major or sharp seventh, from C to B.

SE'VERITE. A hydrated silicate of alumina, found near St. Sever in France, in a gravelly soil, in pieces from two to five inches in diameter.

SEXTANS. The Sextant; a modern southern constellation, consisting of forty-one stars, situated between Regulus and Cor Hydræ.

SEXTANT. An astronomical and nautical instrument, commonly called *Hadley's*, by means of which the direct angular distance of any two objects may be measured, or the altitude of a single one determined, either by measuring its distance from the visible horizon (such as the sea-offing, allowing for its dip), or from its own reflection on the surface of mercury. The principle of this instrument is the optical property of reflected rays, thus announced:—"The angle between the first and the last directions of a ray which has suffered two reflections in one plane, is equal to twice the inclination of the reflecting surfaces to each other."

SEXTILE ASPECT. An astrological term, denoting the aspect of two planets, when they are distant from each other the sixth part of a circle, or sixty degrees.

SEXUAL SYSTEM. A mode of arranging plants, invented by Linnæus, and founded upon the number and peculiarities of the sexual organs. See *Botany*.

SHADOW. If an opaque body be enlightened on one side only, the side which is more remote from the source of light will continue dark, and beyond it there will be a space not affected by the light; this constitutes the *shadow* of the opaque body. If any object intercept this space, that side of it which is next to the opaque body will be darkened by the projection of the shadow upon it.

SHALE (*schalen*, German, to peel, to split). A provincial term adopted by geologists to denote an indurated slaty clay, or argillaceous matter, indurated, with a slaty structure, and a dull grey streak, and naturally divided into laminæ parallel to the plane of deposition. When much intermixed with carbonaceous matter, and impregnated with bitumen, it is usually named *bituminous shale.* When highly impregnated with silica, it passes into *flinty slate.*

SHARP. A character in Music, marked ♯, employed to raise any note of the natural scale, a semitone higher. The *double sharp*, marked ×, is used in chromatic music for raising a note two semitones above its natural state. Thus C double sharp is D natural.

SHEAR-STEEL. This substance, so called because fitted for making *clothiers' shears*, scythes, &c., is prepared by laying several bars of common steel together, and heating them in a furnace until they acquire the welding temperature. The bars are then beaten together with forge-hammers, after which they are drawn anew into bars for sale.

SHELL LIMESTONE. *Muschelkalk.* A compact limestone, of a smoke-grey colour, and in certain localities containing a great variety of fossils. The most esteemed variety for ornamental purposes is that from Carinthia, called *lumachella*, or fire marble. Shell limestone is distinguished from Magnesian limestone by its never presenting the shells of the genus Producta, which occur in this deposit; and from the Lias, by the absence of the Ammonites and Gryphææ which characterize the latter.

SHELL MARL. A deposit of clay, peat, and other substances mixed with shells, which collects at the bottom of lakes.

SHIELDS OF LICHENS. Little coloured cups or lines, also called *scutella* and *apothecia*, appearing on the upper surface of lichens; they are surrounded by a rim, and contain the *asci*, or sporuliferous tubes.

SHINGLE. The loose and completely water-worn gravel on the sea-shore.

SIDEREAL DAY (*sidus*, a star). The space of time elapsing between two consecutive returns of a star to the same meridian. This is equal to the time occupied by one entire revolution of the earth upon its axis. See *Hour*.

SIDEREAL YEAR (*sidus*, a star). The period of time in which the earth makes one complete revolution in its orbit; that is, from any given star to the same again. See *Hour*.

SIDERUM. The name given by Bergmann to phosphuret of iron.

SI'ENITE or SY'ENITE. A compound granular aggregated rock, composed of felspar and hornblende, and sometimes quartz and black mica. It is found at Syene in Egypt, and other places.

SIGHT, FIELD OF. The *field* of a telescope may be measured by directing the instrument to some star in or very near to the equator, care being taken that it shall pass over the *middle* of the field, and then count the number of seconds which elapse during its passage: four seconds of time will make an angle of one minute for the field of vision.

SIGNS of the ZODIAC. The ecliptic is usually divided by astronomers and by globe-makers into 12 signs of 30 degrees each, answering to twelve constellations, with the following names and signs; the parts adjacent to the ecliptic being called the *zodiac*:—

Aries	♈	from	0°	to	30°
Taurus	♉	—	30°	—	60°
Gemini	♊	—	60°	—	90°
Cancer	♋	—	90°	—	120°
Leo	♌	—	120°	—	150°
Virgo	♍	—	150°	—	180°
Libra	♎	—	180°	—	210°
Scorpio	♏	—	210°	—	240°
Sagittarius ...	♐	—	240°	—	270°
Capricornus ...	♑	—	270°	—	300°
Aquarius	♒	—	300°	—	330°
Pisces	♓	—	330°	—	360°

Of these signs, the first six are called *northern*, lying on the north side of the equator; and the last six are called *southern*, being situated to the south of the equator.

SILENA'CEÆ. A sub-order of the family of plants termed Caryophyllaceæ, distinguished from the other sub-order, or *Alsinaceæ*, by the possession of a tubular calyx and clawed petals.

SILEX. The Latin term for *flint;* the name of one of the pure earths, of which flint is wholly composed; in chemical language, it is an oxide of silicon, forming the basis of chalcedony, cornelian, jasper, &c. French geologists have applied the term as a generic name for all minerals composed entirely of silex, of which there are many different external forms.

1. *Silica.* Siliceous earth; the oxide of silicon, constituting almost the whole of *silex*, or flint. It combines with many of the metallic oxides, and is hence sometimes called *silicic acid.*

2. *Silicate.* A chemical compound of silica and another substance, as silicate of iron.

3. *Siliceous.* Of or belonging to the earth of flint. A siliceous rock is one composed mainly of silex.

4. *Silicified.* Any substance which is petrified or mineralized by *siliceous* earth.

5. *Silicon* or *Silicium*. An elementary body very abundant in the mineral kingdom, constituting the basis of silica. It is a dark-brown, inflammable substance, without metallic lustre.

SILI'CULA. A diminutive of *siliqua*, and applied, in botany, to a fruit of the same construction, but shorter and broader than the siliqua, as in candytuft.

SILIQUA. A fruit consisting of two carpels cohering together, the placentæ of which are parietal, and separate from the valves, presenting a kind of frame called a *replum*, and connected by a membranous expansion, as in the stock.

SI'LLIMANITE. A crystallized variety of silicate of alumina, found at Saybrook in Connecticut, in a vein of quartz penetrating gneiss.

SILT. The more comminuted sand, clay, and earth, which are transported by running water. It is often accumulated by currents in banks. Thus, the mouth of a river is *silted* up when its entrance into the sea is impeded by such accumulations of loose materials.

SILU'RIAN SYSTEM. The name given by Mr. Murchison to the upper part of the lower series of secondary rocks, from its being highly developed in that part of Wales which was formerly inhabited by the *Silures*, viz., the counties of Hereford, Radnor, Brecon, Caermarthen, and Pembroke. He divides it into two portions—the *Lower*, comprising the Llandeilo Flags and the Caradoc Limestone; and the *Upper*, consisting of the Wenlock Limestone and the Ludlow Rocks.

SILURIDÆ. A family of *malacopterygious*, or soft-spined fishes, distinguished from all other families of the order by the absence of true scales, having only a naked skin, or large bony plates.

SILVAN. The name given by Werner to the metal tellurium.

SILVER. *Argentum.* A white metal occurring often in the metallic state in mines, and in combination with ores of lead, from which it is separated by cupellation. *Horn silver* is the chloride, resembling horn in consistence. *Fulminating silver* is an explosive substance, formed of oxide of silver and ammonia.

SILVER GLANCE. Vitreous silver, or sulphuret of silver; a mineral occurring massive, crystallized, and in other external forms, among which are the laminar and the capillary. The black silver ore appears to be a pulverulent variety of this species.

SIMARUBACEÆ. The Quassia tribe of Dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* polypetalous; *stamens* twice as many as the petals, hypogynous; *ovarium* 4- or 5-celled; *fruit,* indehiscent drupes.

SI'MIADÆ (*simia,* an ape). A family of Quadrumanous animals, including the apes, monkeys, and baboons of the Old World.

SIMILAR FIGURES. In Geometry, figures are termed *similar,* when they resemble one another in *shape,* without reference to their size; when the latter point of resemblance exists, the figures are said to be *equal.*

SI'MILOR. The designation of an alloy of zinc and copper.

SIMOON. An Arabic term denoting *poison,* and applied to a hot wind which occurs in most countries situated near sandy deserts, and blows from the quarter of the desert. In Turkey the wind is called *Samieli;* in Egypt, *Khamsin;* in Guinea and Senegambia, *Harmattan.*

SIMPLE MINERAL. A term applied to individual mineral substances, as distinguished from rocks, the latter being usually an aggregation of simple minerals. They are not simple in regard to their nature; for, when subjected to chemical analysis, they are found to consist of a variety of different substances. Pyrites is a simple mineral in the sense in which we use the term, but it is a chemical compound of sulphur and iron.

SINE and COSINE. In Trigonometry, the *sine* of any arc of a circle is the straight line drawn from one extremity of the arc perpendicular to the radius passing through the other extremity. The *cosine* is the sine of the complement of an angle or arc, the prefix *co* being merely the abbreviation of *complement,* first introduced by Gunter.

SINGULAR TERM. A singular term, in Logic, is that which stands for *one individual,* and cannot, therefore, be predicated *affirmatively* of any thing but that individual. See *Common Term.*

A *Singular Proposition* is one which has for its subject either a singular term, or a common term limited to one individual by a singular sign, *e. g.* "This." Such a proposition is *universal,* when the *whole* of the subject is spoken of; *particular,* when only a part is spoken of, *e. g.* "Non *omnis* moriar."

SINTER (*sintern,* to drop). A German name for a rock precipitated from mineral waters. *Calcareous* sinter is carbonate of lime deposited in layers; *siliceous* sinter, a variety of common opal.

1. *Sinter, ceraunian.* A variety of quartz consisting of siliceous tubes found in the sands of the Senner Heath in the county of Lippe, where, on account of their supposed origin, they are called lightning tubes, and hence are derived the terms *fulgurite, astraphyalite,* &c.

2. *Sinter, quartz.* Stalagmitic quartz, the most remarkable varieties of which are the siliceous concretions deposited by the celebrated hot spring in Iceland, the Geyser. Another variety is the *pearl-sinter* from Santa-Fiora in Tuscany (whence it has obtained the name of *fiorite*), and from the island of Ischia.

SINUATED (*sinus,* a bay or cavity). Having a wavy margin, produced by alternations of projecting lobes and indentations.

SIPHON (σίφων, a tube). A hydraulic instrument used for emptying liquids from one vessel into another, without disturbing the mass of the liquid. It is merely a bent tube of which one leg is longer than the other. When this is filled with liquid, and the shorter leg is immersed in a vessel to be emptied, the atmospheric pressure on the surface of the liquid will cause it to rise in the shorter leg, and thus a continuous stream will be produced.

SIPHON (in Zoology). A sucker; a fleshy process, generally long, cylindrical, and hollow, protruded by the carnivorous and testaceous animals from the base or channel of their shells. The same term is applied to the slender shelly tube which connects the chambers of cephalopod shells, or the *nautili.*

SIPHONO'STOMOUS (**σίφων**, a tube,

στόμα, a mouth). A designation of animals with a suctorious mouth like a tube. The term is usually applied to an order of the edentulous Crustacea which are so characterized, as the caligus. Under the term *Siphonobranchiata,* De Blainville describes the first order of his first sub-class of Mollusca, Paracephalophora dioica.

SIPHU'NCLE. A long tube, partly calcareous and membranous, which passes through all the compartments of the shells of certain cephalopods; the membranous siphuncle is continued into the animal, and terminates in a cavity contained within its body.

SIRE'NE. An instrument, invented by Caignard Latour, for determining the number of musical vibrations. The notes are produced in it by breaks in a constant stream of air, these breaks occurring at equal intervals of time, so that after each break there is a new wave of air. When the number of waves amounts to 32 in a second, the lowest note is emitted, and the number may be increased to about 16,000 per second, when the note degenerates into a mere whistle.

SIR'IUS. The Dog-star; a star of the first magnitude in the southern constellation Canis major.

SIRO'CCO. The name given to the hot wind which occasionally blows in Sicily, and which is supposed to derive its origin from the excessively heated deserts of Africa. See *Solano.*

SI'TTINÆ (*sittia,* the nuthatch). Sittine birds, or Nuthatches; a family of the Reptatrices of Macgillivray. In the form of the feet and claws these birds resemble the Certhiadæ, while in the structure of the bill they somewhat resemble Woodpeckers, and in their general aspect and habits approach the Parinæ. By other writers, the Nuthatches are included in the family Certhiadæ, belonging to the Insessores or Perchers.

SKO'RODITE (σκόροδον, garlic). Cupreous arseniate of iron; a mineral substance which appears to be closely allied to Bournon's martial arseniate of copper. The name is derived from the garlicky odour it emits when heated.

SKY. The popular name for the blue expanse of atmospheric air. The *blue colour* of the sky has been found by Brewster to be due to light which has suffered polarization, and which is, therefore, reflected light, like the white light of clouds.

SLAG. The glassy compounds produced during the reduction of metallic ores by means of fluxes.

SLATE. *Clay slate.* A geological term for the well-known stone with which houses are roofed, and which consists mainly of clay. It agrees with *mica-slate* in its fissile structure, but differs in having its cleavage more or less transverse to the line of its stratification.

SLATE-CLAY. Another name for *shale,* or argillaceous matter, indurated, with a slaty structure, and a dull grey streak.

SLATE-SPAR. *Schiefer Spar.* The name of a sub-species of limestone.

SLATE, STONESFIELD. A component part of the Lower Oolitic Series, consisting of slaty calcareous limestone.

SLATY GNEISS. A variety of gneiss, of which the texture is usually minute, and the scales of mica or crystals of hornblende form small laminæ, rendering the rock easily fissile.

SLEET. Half-melted snow, constituting an intermediate condition between that of snow and that of rain.

SLI'CKENSIDE. The name given by the Derbyshire miners to the compact and specular variety of *galena,* or sulphuret of lead, from the smoothness of its surface. It occurs lining the walls of very narrow rents.

SLIDING RULE. An instrument consisting of two parts, one of which *slides* along the other, for the mechanical performance of addition and subtraction, and also of multiplication and division, by the use of logarithmic scales, instead of scales of equal parts.

SMALT (*schalmz,* Germ.). A blue-coloured glass, obtained by heating *zaffre,* or the impure oxide of cobalt, with sand and potash, reduced to powder. It is the *blue-stone* used in washing.

SMARA'GD (σμάραγδος). Anciently, this term was applied to a semi-transparent stone like the *aqua marina,* but is now usually employed to designate the *emerald.*

SMELTING. The reduction of metallic ores, for the purpose of extricating the pure metal. With the ore and fuel a third substance, called a *flux,* is usually added, the object of which is to form a fusible compound with the earthy matter of the ore.

SMILA'CEÆ. The Smilax tribe of Monocotyledonous plants. Herbaceous climbing plants; *flowers* hexapetaloïdeous, hermaphrodite, sometimes diccious; *stamens* 6; *ovarium* 3-celled; *fruit* a berry.

SMOKE. Smoke consists of the unconsumed gaseous elements of any body, and, consequently, arises from imperfect combustion.

SNOW. The frozen visible vapour composing clouds. A *flake* of snow exhibits a beautiful display of minute crystals, often possessing the greatest variety of forms. The production of snow offers the most simple case of the precipitation of water from the atmosphere.

SNOW LINE. That limit of elevation in every latitude at which the air attains the temperature of freezing water. The line of *perpetual* congelation is, of course, the summer limit.

SNOW, RED. The colouring matter of this substance appears to be an algaceous plant, named *protococcus nivalis.* Agardh's definition of Protococcus is merely, "plants with aggregated, not mucous globules." To this Greville added, "globules containing granules seated on a transparent gelatinous mass."

SNOWDON ROCKS. One of the subordinate divisions of the Cambrian Group of Rocks, of many colours and textures, varying from fragmentary to the finest roofing-slate.

SOAP. A compound, in definite proportions, of certain principles in oils, fats, or resin, with a salifiable base. *Hard soap* is made of *soda* and fatty or resinous matters; *soft soap* is made of caustic *potash* and acid oil or fat.

SOAPSTONE. *Steatite.* A mineral consisting of silicate of alumina and magnesia, and named from its resemblance to mottled soap and from its unctuous feel.

SO'BOLES. The botanical term for the *creeping stem,* or slender stem of certain plants, which creeps horizontally below the surface of the earth, emitting roots and new plants at intervals, as in triticum repens.

SODA. The protoxide of sodium; an alkali procured from the ashes of marine plants; formerly called the *mineral alkali,* from its being found native, under the name of *natron,* in mineral seams or crusts.

SODA-WATER. A solution of the bicarbonate of soda in water, when an additional quantity of carbonic acid has been forcibly combined with it.

SO'DALITE. A mineral substance consisting of a silicate of soda and alumina, found in Greenland, in Mount Vesuvius, and in Siberia.

SODIUM. *Natrium.* A white metal with the aspect of silver, soft and malleable at 32°, quite liquid at 194°, and volatilized at a red heat. Davy obtained this metal by the voltaic decomposition of soda, immediately after the discovery of potassium.

SOIL, VEGETABLE. The external thin layer of earth in which plants grow, composed of fragments of minerals, vegetables, and animals, reduced to a great degree of tenuity.

SOL. The Sun; a globe, 1,300,000 times greater than the earth, and situated at a mean distance of 94½ millions of miles from the earth.

SOLANA'CEÆ. The Nightshade tribe of dicotyledonous plants. Herbaceous plants or shrubs, with *leaves* alternate; *flowers* monopetalous, regular; *stamens* inserted into the corolla; *ovarium* 2-celled; *fruit* succulent.

SOLA'NO. The name given to a hot wind which blows in Spain and Portugal. It is a modified sirocco.

SOLAR DAY. The interval between two transits of the sun over the meridian. It is longer than the sidereal day; for if the sun move slowly eastward, and if it be on the meridian with a certain star to-day, then to-morrow, when that star comes on the meridian, the sun will be a little to the eastward, or not yet on the meridian: that is, the solar day is not quite completed in a sidereal day.

SOLAR PHOSPHORUS. A general term for those substances which, after exposure to light, exhibit phosphorescent properties, as Canton's phosphorus, &c.

SOLAR SYSTEM. The Solar System comprises the sun as a centre, and thirty other bodies, which revolve round him in regular periods and at various distances. See *Planet.*

SOLDER. A simple or mixed metal, by means of which metallic bodies can be firmly united with each other. *Hard solders* are ductile, malleable, and are usually prepared of the same metal with that which is to be soldered, with the addition of some other; *soft solders* melt readily, are partly brittle, and therefore not malleable; bismuth is much used in the composition of soft solders, from its capability of forming with several metals compounds of remarkable fusibility.

SOLDERING. The process of uniting the surfaces of metals, by the intervention of a more fusible metal, which, being melted upon each surface, serves, partly by chemical attraction, and partly by cohesive force, to bind them together. See *Solder*.

Soldering, autogenous. This process consists in the union of two pieces of metal without the interposition of any solder, by fusing them at the point of junction by jets of flame from a gas blow-pipe.

SOLENI'NÆ. The Solens; a subfamily of the Myadæ, or Gaping bivalves, named from the genus *solen*, and having their shells always open at both extremities.

SO'LENOID (*σωλὴν*, a channel, a cylindrical box, *εἶδος*, likeness). The name given by Ampère to what is otherwise called an *electro-dynamical screw*, or electro-dynamical cylinder. It consists of a linear series of circular currents passing at right angles to the axis of the spiral conductor.

SOLFATA'RA. A volcanic vent from which sulphur, sulphureous, watery, and acid vapours and gases are emitted. The name is derived from *Solfaterra*, the celebrated mountain of Naples, called by the ancients *Phlegræi campi*.

SOLID. In geometry, a *solid figure* is one enclosed by, at least, four planes or *faces*, and named from the number of its faces; thus a figure with *four* faces is called a *tetrahedron;* one with *six*, a *hexahedron;* those with more than six, *polyhedrons*. Solids are also named according to the figures and positions of their faces, as the prism, the parallelopiped, &c.

1. *Solid dimension.* Length is said to be a quantity of one dimension, surface of two, and solidity of three, viz. length, breadth, and thickness. The right line, the right surface or rectangle, and the right solid or rectangular parallelopiped are the implements of mensuration.

2. *Solid of least resistance.* A term applied to a geometrical solid of such a shape as will enable it to move with the least resistance through the air, water, or other fluid. Such a solid is a *conoid*.

3. *Solids, regular.* A regular solid is one whose faces are equal, equilateral, and equiangular plane figures. There are, but cannot be more than, five regular solids; three of these have triangular faces, one square faces, and the remaining one pentagonal faces.

4. *Solid problem.* A solid, as distinguished from a plane, problem, in geometry, is one which cannot be constructed by the intersections of circles and straight lines, but requires for its construction the description of one or more conic sections.

SOLID (in Physics). A term denoting that constitution of matter in which the attractive forces of the molecules are greater than the repulsive, and the molecules consequently cohere with more or less force. In the *liquid* state, the two forces are balanced; in the *gaseous* the repulsive predominates.

SOLIDIFICA'TION. The condition exactly opposed to liquefaction; it is the state assumed by liquid bodies on parting with their free caloric. Without adhering strictly to this rule, we generally use the term *solidification*, when we speak of such fluids as become solid at a temperature higher than that of freezing water; and *freezing*, when we speak of such as become solid at a point below 32°.

SOLIDU'NGULA (*sola ungula*, a single hoof). *Solipeds.* A group of pachydermatous animals, comprising quadrupeds with only one apparent toe, and a single hoof to each foot, as the horse.

SOLITA'RIUS. The Hermit; an obscure constellation of Lemonnier, situated a little above Centaurus, near the tail of Hydra.

SO'LSTICES (*sol*, the sun, *sto*, to stand). The two extreme points of the Sun's apparent course north and south of the equator. These are the first points of Cancer and of Capricorn, where the sun *appears to make a stand*, going neither northward nor southward. The two corresponding periods of the year are called the *Summer* and the *Winter solstices*, from the seasons in which the apparent *standings* of the sun occur.

SOLUBI'LITY. A contrivance of nature for facilitating the dispersion of seeds in some plants. It arises from the presence of certain transverse contractions of a 1-celled pericarp, through which it finally separates into several closed portions, as in ornithopus, entada, &c.

SOLU'TION (*solvo*, to dissolve). The operation of dissolving a solid or aëriform body in a liquid. The condition of the solid or aëriform body is called its *solution;* the liquid which effects the change is the *solvent*. When the liquid will dissolve no more of the solid, but allows the excess to be deposited on the bottom of the vessel, it is said to be *satu-*

rated, and the mixed fluid is then a *saturated solution* of the substance which it contains.

1. *Chemical solution.* This term denotes that a perfect chemical union of the solid with the liquid is produced, in accordance with the laws of definite proportions. Both the constituents of the compound exhibit a change in their properties, and are combined in an entirely new substance formed by their union, which substance, on the completion of the process, generally assumes a solid form, that is, it becomes crystallized.

2. *Mechanical solution.* This is the mere union of a solid with a liquid, in such a manner that its aggregate form is changed without any alteration being effected in the chemical properties of either the solid or its solvent. If the latter be separated from the solution, as by heat, the former which has been dissolved is obtained again with its chemical properties unaltered.

3. *Moist and dry solutions.* In the former, at least one of the bodies, the solvent, must be a liquid; in the latter, both of the substances are solids, and liquefaction must be brought about by means of heat before any combination will take place. *Bronze*, for instance, is such a solution of copper and tin.

SO'LVENT (*solvo*, to dissolve). A fluid which causes the *solution* of a solid or aëriform body; chemically, a menstruum. Some of the most powerful solvents are the sulphuric, nitric, and chloric acids.

SOMMERVILLITE. A new mineral from Vesuvius, occurring in cavities with crystallized black mica.

SO'MMITE. *Nepheline.* Rhomboidal felspar, occurring, in drusy cavities, at Monte Somma, near Naples, in granular limestone.

SONI'FEROUS BODIES. For the production of sound there is required, besides the *sonorous body*, one that is adapted to convey the sound, or rather the vibrations, of the former body to the ear: bodies of this class are called *soniferous* bodies, and they are such as can transmit the vibrations, imparted to them by the sonorous bodies, in all directions throughout their mass, and with equal velocity.

SONO'METER. An apparatus for illustrating the phenomena presented by sonorous bodies, and the ratios of their vibrations, by the transverse vibrations of tense cords. See *Monochord.*

SONOROUS FIGURES. This subject has been already noticed under the term *Nodal Lines.* To make these figures visible, and to render them permanent, strew some fine sand on a disc of glass or metal; hold the disc firmly between two fingers, and draw a violin-bow down on its edge, and a musical note will be heard; at the same instant the sand will be in motion and gather itself to those parts which continue at rest, i. e. to the nodal lines. The figures may also be seen if a small quantity of water be poured on the plate, nay, even by the rays of light falling on it.

SO'PHISM (*σόφισμα*, a captious argument, a fallacy). An argument which appears true, but is fallacious. Sophisms are generally traceable to the *assumption of doubtful premises*, or the *assumption of a hypothetical cause.*

SORBIC ACID. An acid obtained from the berries of the *Sorbus aucuparia*, or Mountain Ash. It appears that the sorbic and *pure* malic acids are identical. *Sorbates* are compounds of sorbic or malic acid with the salifiable bases.

SORE'DIA (dim. of *σωρὸς*, a heap). *Globuli; glomeruli.* Small heaps of powdery bodies lying upon any part of the surface of the thallus of lichens. The bodies of which the soredia are composed, are called *conidia* by Link, and *propagula* by others.

SORI'CIDÆ. The Shrew tribe; a family of the insectivorous vertebrata, consisting of a kind of carnivorous mice, which, though they do not burrow, like the talpidæ, retire into holes during the winter for repose, and are partially aquatic in their habits.

SORI'TES (*σωρείτης*, heaped up, from *σωρὸς*, a heap). In logic, a *heap of syllogisms*, the conclusion of each forming the premiss of the next in order. In the abridged form in which this argument occurs, the *predicate* of the first proposition is made the *subject* of the next; and so on, to any length, till, finally, the predicate of the last of the premises is predicated (in the conclusion) of the subject of the first: *e. g.* A is B, B is C, C is D, D is E; therefore A is E.

SORO'SIS (*σωρὸς*, a heap). A collective fruit, consisting of a juicy spike or raceme, having all its ovaria and floral envelopes cohering into a single mass, as in the mulberry, the pine-apple, the bread-fruit, &c.

SORUS (*σωρὸς*, a heap). The botanical term for each cluster of sporuliferous thecæ developed on the under surface of the fronds of Ferns.

SO'THIAC PERIOD. A term employed in the calendar of the Egyptians and the Persians. Their year is supposed to have comprised 365 days, so that every four years they lost a day in the solar year, and, after a period of 1460 years, called the *Sothiac Period*, or *great canicular year*, the civil and the solar years recommenced at the same time; or, in other words, the canicula or dog-star would then again rise heliacally at the beginning of their year. The 365 days of the year composed twelve months, each of thirty days, and the five remaining days were added under the name of *epagomenæ*, or supplementary days.

SOUND. A sensation produced through the ear, by the vibrating or tremulous motion of a sounding body. This motion is communicated to the surrounding air, and is conveyed by this medium to the drum of the ear, which also undergoes a vibrating motion, and this last motion, by throwing the auditory nerves into action, produces the sensation of hearing.

1. *Sound, waves of.* Every vibration of a sonorous body produces a progressive wave in the air, which moves in a direction perpendicular to the surface of such body. These undulations are called *waves of sound*, and every right line, perpendicular to their surface, or to that of the sonorous body, is called a *ray of sound.* It has been supposed that a wave of vibration, "the sigh of a drowning slave,"—proceeds in constant undulation through space, and a similar idea has been applied to the radiations of light from external objects.

2. *Sound, Musical.* When a number of sounds, or vibrations, succeed one another with such regularity as to produce the impression of a single sound, this is called a musical sound. The *quantity* of a musical sound depends on the extent and velocity of the vibrations, and corresponds to the *strength* or *intensity* of the sound. The *quality* of a sound is independent of its quantity, and relates to the different instruments by which it is emitted, as by the human voice, the cord of a violin, &c. Our appreciation of the quality of sounds has not been satisfactorily explained.

SOUNDINGS. This term denotes, in hydrography, the depths of water in rivers, harbours, along shore, and even in the open seas. The term is also applied to the nature of the ground at the bottom of the water.

SPA WATER. An acidulous chalybeate, containing more iron and carbonic acid than any other mineral spring.

SPACE (*spatium*). A general term for extension in all directions. From the idea of *space* follows that of *form*, which is the conception of the manner in which one part of space is separated from the rest; and from the investigation of forms arises geometry. In this restricted signification, space denotes *area*, as when it is said that two straight lines cannot enclose a space, that is, an area.

SPADIX. A form of inflorescence, in which the flowers are arranged close together upon a succulent axis, which is enveloped in a sheath, or *spathe.* This mode of inflorescence is characteristic of the natural orders Araceæ and Acoraceæ.

SPANGLED ROD. A glass tube, on the surface of which are pasted spangles of tinfoil in a spiral form and at small intervals. An electric spark transmitted along such a conductor appears at the same instant at all the intervals.

SPANISH CHALK. Steatite, or soapstone; a sub-species of rhomboidal mica.

SPAR (*spath*, German). A term frequently applied to stones, the broken surfaces of which present polished shining plates, placed over one another in horizontal layers. This is the *sparry* texture, and minerals of this kind are generally called *spathose.*

SPA'RIDÆ. *Sparoides.* A family of acanthopterygious fishes, named from the genus *sparus*, or Gilt-head. The palate is edentulous, but the jaws are well furnished with teeth, and it is upon the various modifications of the teeth that the genera are formed.

SPARRY ANHYDRITE *Cube-spar.* A sub-species of prismatic gypsum, found in the salt-mines of Halle, &c.

SPARRY IRON. Carbonate of iron, found abundantly in limestone. It affords an iron well suited for conversion into steel.

SPATHE' (σπάθη, any broad plate, of wood or metal; a flower-sheath). The botanical term for a large bract, which envelopes the *spadix* of the arum and other plants.

SPECIES. A logical species is a predicate which is considered as expressing the *whole essence* of the individuals of which it is affirmed. A predicable which expresses only *a part*, is of two kinds: it may express the material part, and is then called the *genus;* or the formal and distinguishing part, and is then called the *differentia.* Hence the genus and differentia, taken together, constitute the species; *e. g.* "rational" and "animal," constitute "man."

1. *Species in Natural History.* Naturalists employ the term "species" in a technical sense, or "second intention," when applied to *organized beings.* In this case it denotes such individuals as are supposed to be *descended from a common stock,* or which *might* have so descended; *viz.* which resemble one another (to use Cuvier's expression) as much as those of the same stock do.

2. *Species, in Mathematics.* Euclid employed the word 'species' in its primitive sense of *appearance:* when the form of a figure is given, he speaks of the figure as given 'in species;' thus, "rectilineal figures are said to be given in species, which have each of their angles given, and the ratios of their sides given."

3. The term *species* was employed by Vieta in its logical sense, as opposed to individual, in designating the algebraical notation in those cases in which letters were used for numbers in a general sense. Thus he termed the logistics, or the science of calculation, *specious;* and, hence, the language of algebra was, for some time, called the specious notation.

SPECIFIC. A term denoting any property which is not general, but confined to an *individual* or a *species.*

SPECTRUM. This Latin term denotes an *ideal form,* and is applied to certain optical phænomena, described under the term *colours accidental;* and to the effect of refraction on a ray of light, explained under the word *prismatic spectrum.*

SPECULAR IRON ORE. *Iron-glance,* or *fer oligiste* of the French. A sub-species of rhomboidal iron ore, comprising two varieties, viz. the *common,* occurring in beds in primitive mountains, and affording an excellent malleable iron; and the *micaceous,* found in beds in mica slate, and yielding an iron well suited for cast ware.

SPE'CULUM. The Latin term for a looking-glass; a name frequently given to a mirror used for any scientific purpose, as in a reflecting telescope. See *Mirror.*

SPECULUM METAL (*speculum,* a looking-glass). An alloy of about two parts of copper and one of tin; used for making mirrors.

SPEISS. An artificial arseniuret of nickel, containing about 54 per cent. of nickel. It collects at the bottom of crucibles in which smalt or cobalt blue is prepared.

SPELTER. The name by which zinc is known in commerce; but it usually contains some lead and sulphur.

SPERMATOCYSTI'DIUM (*σπέρμα,* a seed, *κύστις,* a bladder). The name given by Hedwig to the male organ of mosses; it is a pedunculated oblong sac, containing a fluid mixed with a granular pulp, which is discharged with some force from the sac on the application of water. By other writers these bodies are called *staminidia* or *antheridia.*

SPERMATO'PHORA (*σπέρμα,* seed, *φέρω,* to carry). The cylindrical capsules or sheaths in the cephalopods which convey the sperm. They are also called the *moving filaments* of Needham, their discoverer.

SPERMATOZO'A (*σπέρμα,* seed, *ζῶον,* an animal). Zoosperms, or animalcules found in the vas deferens and the vesiculæ seminales of animals, and, it is said, in cryptogamic plants, and in the pollen grains of the higher orders of plants.

SPE'RMODERM (*σπέρμα,* seed, *δέρμα,* skin). The testa, primine, or external membrane of the seed of plants. The term is sometimes applied collectively to all the integuments of the seed.

SPHÆRE'NCHYMA (*σφαῖρα,* a sphere, *ἔγχυμα,* any thing poured in). *Merenchyma.* The name given by Morren to the spherical variety of the parenchyma of plants.

SPHÆROSIDE'RITE. *Sparry iron ore.* Carbonate of iron, occurring crystallized, fibrous, massive, and botryoidal.

SPHÆ'RULITE (*σφαῖρα,* a sphere, *λίθος,* a stone). A silicate of alumina, occurring in small botryoidal and spheroidal masses, imbedded in pitchstone, in pearlstone, &c.

SPHALERO-CA'RPIUM (*σφαλερὸς,* delusive, *καρπὸς,* fruit). A botanical designation of the collective fruit of the yew, blitum, &c., described as an indehiscent, one-seeded pericarp, enclosed within a fleshy perianth. This is the *nux baccata* of authors.

SPHE'CIDÆ. *Sphegides.* A family of hymenopterous insects of the section Fossores, named from the typical genus *sphex,* one species of which has been found in England, but appears to be extremely rare.

SPHENE. Prismatic titanium ore; a silico-titanite of lime, comprising the *common* and the *foliated* varieties.

SPHERE (σφαῖρα, sphæra). A geometrical solid described by the revolution of a semicircle about its diameter, which remains unmoved, and constitutes the *axis* of the sphere. A sphere is bounded by a curve surface, such that every point thereon is situated at an equal distance from a point within the solid called the *centre*. The *diameter* of a sphere is any straight line which passes through the centre, and is terminated both ways by the superficies of the sphere.

1. The term *Sphere* is applied, in astronomy, to the great concavity formed by the space surrounding our globe, in which we see the celestial bodies. It appears to revolve upon the two poles.

2. Those places with respect to which the poles are situated in the horizon, are said to have a *right position of the sphere;* those whose horizon coincides with the equator, have a *parallel position* of the sphere. For all intermediate places, the position is *oblique*.

3. A *great circle of a sphere* is that whose plane passes through the centre of the sphere; it divides the sphere into two equal parts, and has the same centre as the sphere itself. The plane of a *small* circle does not pass through the centre of the sphere.

4. *Sphere, doctrine of the.* An expression generally signifying the application of the geometrical notions of the sphere to geography and astronomy. It comprises an explanation of the circumstances under which spherical trigonometry is applicable to these two sciences, and the nomenclature which is employed to facilitate explanation.

SPHE'RICAL (σφαῖρα, a sphere). Relating to a sphere. A *spherical angle* is an angle formed on the surface of a sphere by the intersection of two great circles, or circles whose planes pass through the centre. A *spherical triangle* is a triangle formed by the intersecting arcs of three such circles.

SPHERICAL EXCESS. In trigonometry, this denotes the sum by which the three angles of any triangle on the surface of a sphere or spheroid exceeds two right angles.

SPHERICS (σφαῖρα, a sphere). The doctrine of the properties of the sphere considered as a geometrical body, and, particularly, of the different circles described on its surface.

SPHEROID (σφαῖρα, a sphere, εἶδος, likeness). A solid body approaching to the figure of a sphere. There are two kinds of spheroid, the *oblate*, and the *oblong* or prolate, the former shaped like an orange, the latter like a lemon; each may be supposed to be described by the revolution of a semi-ellipsis round its axis, the former by the motion of the semi-ellipsis round its lesser axis, the latter by the ellipsis divided longwise, and turned round the greater axis. The earth is an *oblate spheroid*, being flattened at the poles. See *Ellipsoid.*

SPHERO'METER (σφαῖρα, a sphere, μέτρον, a measure). An instrument for the accurate measurement of the thickness of small bodies, the curvature of optical glasses, &c.

SPHE'RULA. A little sphere; a term applied to the globose peridium of some fungaceous plants, having a central opening through which sporidia are emitted, mixed with a gelatinous pulp.

SPHI'NGIDÆ. A family of lepidopterous insects, belonging to the section *Crepuscularia*, and named from the genus *sphinx*, one species of which (*atropos*) is the death's-head hawk-moth, of considerable size, and not uncommon in some parts of England.

SPHRA'GIDE (σφραγὶς, a seal). Lemnian earth, supposed by the Turks to possess medicinal virtue; hence it was dug up by them with religious ceremonies, divided into spindle-shaped pieces, and stamped with a seal.

SPICA VIRGINIS. A star of the first magnitude in the constellation Virgo.

SPIKE. A form of inflorescence, in which all the buds of an elongated branch develop as flower-buds, without forming peduncles, as in barley. It differs from a raceme merely in having its flowers sessile.

SPIKELET. *Locusta.* A small spike; an integral portion of the inflorescence of wheat and other grasses.

SPINE OF PLANTS. A small conical projection, consisting of a hardened branch, sometimes bearing leaves. It differs from the *prickle* in having a considerable quantity of woody tissue in its structure, and in being as much in communication with the central parts of a stem as branches themselves.

SPINELL. Aluminate of magnesia; a sub-species of octohedral corundum, of a red colour, used as a precious stone. When it weighs four carats (about 16 grains), it is considered of equal value with a diamond of half the weight.

SPINELLANE. A silicate of alumina, said to be a variety of Haüyne, found on the shores of the lake of Laach, in a rock composed of glassy felspar, quartz, hornblende, &c.

SPINI-CEREBRA'TA. The name given by Dr. Grant to those vertebrated animals, of which the central parts are in the form of a lengthened dorsal nervous cord, developed anteriorly into a brain, and protected by a vertebral column and cranium. These are the *myelencephala* of Owen.

SPI'NNARETS. The articulated tubes with which spiders construct their webs.

SPINTHERE. A substance supposed to be a variety of *sphene*. It occurs in the department of Isere in France, incrusting calcareous spar crystals.

SPIRACLES (*spiraculum*, a breathing hole). The breathing pores in insects.

SPIRAL (*σπεῖρα*, any thing rolled round on another thing). A curve which turns round like a circle, but, instead of ending where it began, it continues to revolve, receding further and further from the centre, like the spring which moves the wheels of a watch. It may be briefly described as a curve which winds round a point in successive convolutions.

SPIRAL VESSELS. *Trachenchyma.* Long cylindrical tubes, constituting the *vascular tissue* of plants. Each tube tapers to each end, and has an elastic spiral fibre generated within it.

SPIRE (*σπεῖρα*, a coil or spiral line). A term applied, collectively, to the convolutions of a spiral shell which are placed above the lowest or body-whorl, whatever shape it may assume. In *planorbis* the spire is sunk; in *cypræa* it is so small as to be seen only when the shell is young, after which period it is covered by the enlargement of the body-whorl.

SPIRIT. A general term for all inflammable liquors obtained by distillation, now almost exclusively applied to spirit of wine or alcohol. Ordinary spirits contain from 50 to 52 per cent. of alcohol; *spirits of wine*, from 62 to 67 per cent.; *rectified spirits*, from 82 to 85 per cent.

Spirit, proof. By the expression that a spirit is any number, say *ten, over proof*, is meant that 100 gallons of the spirit would bear the addition of ten gallons of water to reduce it to proof strength, or it would form 110 gallons of proof spirit, *i. e.* spirit of density 0·918633. The term *ten, under proof*, means that ten gallons of water must be taken from 100 gallons of the spirit to raise it to proof, or that 100 gallons of it contain only 90 gallons of proof spirit.

SPIRIT-LEVEL. A glass tube nearly filled with spirit of wine, and hermetically sealed at both ends. The exact horizontal position of its axis is ascertained by the extremities of the air-bubble being at equal distances from the middle point in the length of the tube. The level is used for determining the relative heights of ground at two or more stations.

SPIRU'LIDÆ. A family of polythalamous, decapodous, dibranchiate cephalopods, consisting of the single genus *spirula*, and named by Professor Owen.

SPODIUM (*σποδὸς*, a cinder). A name sometimes given to the oxide of zinc, which sublimes during calcination.

SPO'DUMENE. *Triphane.* Prismatic triphane spar; a silicate of lithia and alumina, found in embedded crystalline masses.

SPONDY'LIDÆ. A natural family of marine conchifers, named from the genus *spondylus*, which appears to be co-extensive with the family itself. The fossils of this family are very numerous, and a somewhat wide geological distribution. The genus *plicatula* is with difficulty distinguished from spondylus.

SPONGE (*spongia*). A porous substance, generally referred to the class of poriferous animals. The sponge of commerce is the dry skeleton of the animal, from which the gelatinous flesh has been removed.

SPO'NGIOLE or SPONGELET (*spongiola*, a little sponge). The absorbing extremity of the fibril of a root, consisting of extremely lax cellular tissue and mucus. It is not a special organ, but merely the newly formed and forming tender tissue. The term *spongiole* is also applied to the warty excrescence often found near the hilum of seeds, and is then nearly synonymous with *strophiola*.

SPORANGI'UM (*σπορὰ*, a spore, *ἀγγεῖον*, a vessel). The theca, or case, which contains the spores of cryptogamic plants: some writers consider this organ to be formed by the adhesion of an external and internal series of organs, the inner series being called *sporangidium*, to which the peristomium belongs. A combination of sporangia is termed by the German botanists a *sporocarpium*, especially when they are enclosed in a common membrane.

SPORE (σπορὰ, a seed). *Sporule.* The reproductive body in cryptogamic plants, analogous to the *seed* of other plants, but differing from this in its mode of development and in its structure; being produced apparently without the agency of sexes, and not germinating from any fixed point, but producing its stem and root indifferently from any points of its surface.

SPORI'DIA. Granules resembling sporules, occurring in algaceous plants, but of doubtful nature. In fungaceous plants, the term denotes the immediate covering of sporules. *Sporidiola* are the sporules themselves.

SPRING. A piece of mechanism, formed of a plate of steel or other elastic substance, employed as a moving power, or as a regulator of the motions of wheel-work; also for the purposes of producing resistance, or of preventing a shock from the collision of hard bodies. In the form of the *balance*, it is employed as a means of measuring weight or force.

SPUR. *Calcar.* The name given to a petal which is lengthened at the base into a hollow tube, as in orchis, &c. This is sometimes called *nectarotheca*, though frequently without reason.

SQUA'LIDÆ. A family of chondropterygious fishes, named from the genus *squalus*, and including the various species of sharks.

SQUAMA. A scale; a term applied in botany to any kind of *bract* which has a scaly appearance. A diminutive of this is *squamula*, and is used to denote each of the minute hypogynous scales or bracts found within the outer envelopes of grasses.

SQUA'MIPENNES (*squama*, a scale, *penna*, a fin). A family of acanthopterygious or spiny-finned fishes, in which the soft and even the spinous parts of their dorsal fins are covered with scales, as well as the rest of their body. The chætodon may be taken as a type of the family.

SQUARE. In Geometry, a square is a plane four-sided figure, with all its sides equal, and all its angles right; or it may be described as a rectangle, which has two adjoining sides equal. In arithmetic and algebra, a square signifies the number produced by multiplying a number by itself. The reason of this double use of the word 'square' is obvious: the square of 12 is 144, and this is the arithmetical mode of finding the content of a square of 12 units in length and breadth; but, to avoid the confusion occasioned by this double use of the word, it has been proposed to speak of the square *on* a line in geometry, and of the square *of* a number in arithmetic and algebra. See *Power of Numbers.*

SQUARE MEASURES. *Measures of Superficies.* In square measure the yard is divided, as in general measure, into *feet* and *inches*, 144 square inches being equal to a square foot, and 9 square feet to a square yard. For land measure, the multiples of the yard are the *pole*, the *rood*, and the *acre;* the pole being equal to 30¼ square yards, the rood to 40 poles, the acre to 4 roods.

SQUARE NUMBER; SQUARE ROOT. A *square number* is the product of a number multiplied by itself, as 25, the square of 5. A *square root* is the name of a number with reference to its square, as 5, the square root of 25. When a number has no exact root, an approximate root may be found by the usual process of extraction: thus, 2 has no square root, but 1.4142136 multiplied by itself, is nearly 2, and is therefore the square root of something very near 2.

SQUARROSE. A term applied, in descriptive botany, to parts which are spread out at right angles from a common axis, as the leaves of some mosses, the involucra of some compositæ, &c. By *squarrose-slashed*, as applied to leaves, is meant, slashed with minor divisions at right angles with the other divisions.

STABLE and UNSTABLE. These are terms employed in physics in connexion with *equilibrium* and *centre of gravity.* Suppose a body to be in equilibrium under the action of any forces; let the body be arbitrarily displaced very slightly from the position of equilibrium, then if the forces be such that they tend to bring the body back to its position of equilibrium, the position is *stable;* but if they tend to move the body still further from the position of equilibrium, it is *unstable.* An egg will rest upon its side in a position of *stable* equilibrium; if placed on one end, it will be in a position of *unstable* equilibrium.

STAFFA. A small island, lying west of the larger trap masses of Mull, entirely composed of amorphous and pillared basalt, the pillars being generally arched over by trap rock which is often prismatised in an irregular manner.

STA'LACTITE (σταλάζω, to drop). Substances found suspended from the roof of mountain caverns, being formed by the oozing of water charged with calcareous particles, the former of which evaporates, leaving the latter behind, which hang down in long rods, like icicles. The *oriental alabaster* appears to be of stalactitic origin.

STA'LAGMITE (σταλαγμὸς, a dropping). The crust composed of layers of limestone, which is formed when water holding lime in solution *drops* on the floor of a cavern: the water evaporates, the lime remains.

STA'MEN (στήμων, the thread of the warp). The male organ of flowering plants, placed immediately inside the petals, and constituting collectively the *androceum*, or male apparatus of the flower. The stamen consists of the *filament*, the *anther*, and the *pollen*, the first of which is not essential: a stamen may exist without a filament, but it cannot exist without an anther and pollen. See *Adelphia*.

STAMINI'DIA (*staminidium*, a little stamen). A term applied to small stamen-like organs occurring in some cryptogamous plants. These are the *spermatocystidia* of Hedwig; they are found in Jungermannia and in some species of mosses, but no analogy of function to that of the stamen in flowering plants must be inferred from the name.

STANDARD. *Vexillum*. The upper, erect, and expanded petal of a papilionaceous corolla.

STANDARD STARS. The name given by astronomers to those stars which are best known and best adapted for accurate observation.

STANNOUS OXIDE (*stannum*, tin). Protoxide of tin. *Stannic oxide* is the peroxide of the same metal. By *stannate*, is meant a salt of tin or the protochloride.

STAR. A general term for all the heavenly bodies. In Astronomy, however, there are several classes of stars: *fixed stars* are those which, in the revolution of the sphere, seem always to occupy the same relative position, and to preserve the same distances one from another; *erratic stars*, or *planets*, are those which, besides the daily revolution, have a motion peculiar to themselves, which alters their relative distances from the other bodies around them. See *Planet* and *Nebula*.

Binary Stars. By this term are denoted sidereal systems, composed of two stars revolving about each other in regular orbits; the individuals are equidistant from the eye; or, at least, cannot differ more in distance than the semi-diameter of the orbit they describe about each other, which is quite insignificant when compared with the immense distance between them and the earth. These must be distinguished from the *double stars*, already noticed, in which these physically connected stars are confounded, perhaps, with others only *optically* double, or casually juxtaposed in the heavens at different distances from the eye. *Herschel*.

STARCH. *Fecula; amylin*. An organized substance separated from the grains, roots, and stems of many plants. It is contained in the cavities of the vegetable cells, in the form of small, white, and brilliant grains, which are not crystalline, but have a rounded outline without any determinate form. Varieties o this substance occur in arrow-root, amidin, dextrin, &c.

STATICS (στατικὸς, causing to stand). That division of the science of mechanics which relates to the condition of bodies as influenced by forces which are in *equilibrium*. It thus differs from the other division, or *Dynamics*, which treats of forces which produce *motion*.

1. The general laws of *Statics* and *Dynamics* are applicable to fluids; but, owing to the peculiar difficulty attending the consideration of this class of bodies, they are generally treated separately, that part of the mechanics of fluids which relates to equilibrium being termed *hydrostatics*, while that which investigates their motion is termed *hydrodynamics*.

2. *Statical figure*. The figure which results from the equilibrium of forces.

STATION. A technical term employed in botanical language to denote the peculiar nature of the locality where each species of plants is accustomed to grow, and it has reference to climate, soil, humidity, light, elevation above the sea, and other analogous circumstances. See *Habitation*.

STATIONARY. This term is applied by astronomers to the condition of a planet, so far as *visible* motion is concerned. The planets move sometimes from west to east, sometimes from east to west, but much more in the former than in the latter direction, so that they may be said to *progress* with occasional *retrogradations.* The end of each kind of motion and the beginning of the next is performed with such extreme slowness, that for several days together the planet does not *seem* to change its place among the stars at all, whence it is said to be *stationary, i. e.* so far as we can trace its motion.

STATI'STICS. That department of political science which relates to the investigating and the arranging of facts illustrative of the actual condition and resources of a state. It is the basis upon which the statesman and the political economist reason, and from which they draw conclusions.

Medical statistics consists in the application of numbers to illustrate the natural history of men in health and disease.

STAU'ROLITE (σταυρὸς, a cross, λίθος, a stone). *Staurotide.* A bisilicate of alumina and of oxide of iron, called also *granatite* and *cross-stone,* among the specimens of which are the fine mackled crystals from Britany, and the modifications of the simple crystals from St. Gothard, accompanied by prisms of disthène, perfectly similar to those of the staurolite, and sometimes longitudinally grown together with them.

STEAM. The vapour of water raised to a high degree of elasticity by heat. When raised at the ordinary temperature, it is termed *low-pressure* steam; when heat is applied to ordinary steam, under a constant bulk, its elasticity rapidly increases, and it is then termed *high-pressure* steam.

STEAM ENGINE. There are two kinds of steam engine in general use, the low-pressure and the high-pressure engine. See *Steam.*

1. The term *low-pressure engine* is not in all cases correct, for many of these engines, particularly those which combine expansion with condensation, work with a considerable load on the safety-valve, as in the case of the Cornish engines. But the term *condensing engine* always conveys a true impression, viz. that the engine is provided with a condensing apparatus.

2. The terms *high-pressure engine* and *non-condensing engine* are equally significant: such engines, having no condensing apparatus for the production of a vacuum, are obliged to work with steam of higher pressure than that of the atmosphere. The essential parts of a high-pressure engine are only two in number, the boiler and the cylinder; the low-pressure engine requires the presence of a third part, the condenser.

3. *Classification of Engines.* The following classification of the various steam engines, according to the principles by which they are worked, may be found convenient as a table of reference:

I. *Condensing Steam Engines.*

1. Simple condensation in the cylinder.
    Atmospheric engines.
2. Simple condensation in the condenser.
    1. Watt's single-acting engines.
    2. Watt's double-acting engines.
    3. Cornish single-acting engines.
3. Condensation and expansion.
    1. Expansion in one cylinder.
        1. Watt's engines, single and double.
        2. Cornish engines, single and double.
    2. Expansion in two cylinders.
        Hornblower's and Woolf's engines.

II. *Non-condensing Steam Engines.*

1. Simple generation of steam.
2. Generation and expansion of steam.

STE'ARIC ACID (στέαρ, suet). An acid procured from animal and vegetable fats, and from the bile of many animals. *Stearine* is a solid crystallizable substance, the essential part of all kinds of suet. *Stearopten* is the solid portion of a volatile oil, as distinguished from elaopten, or the liquid portion.

STE'ATITE (στέαρ, suet). Another name for *soapstone,* derived from its greasy feel. It may easily be cut with a knife, and yields even to impressions of the nail. The most remarkable varieties are, that of a yellowish-green colour from Greenland, and that from Göpfersgrün in Baireuth, with small crystals of other mineral substances, especially quartz, converted into, and forming part of, the massive steatite; a variety called *chalk of Briançon,* &c.

STEEL. Carburetted iron; the average proportion of carbon is supposed to amount to $\frac{1}{140}$ part. The different *tempers,* or degrees of hardness, of rigidity, or of elasticity of steel are given by means of the different degrees of heat to which the metal is exposed in the operation.

STEEL-YARD. The steel-yard differs from the *balance,* in having its support near one end, instead of in the middle; and also in having the weights suspended by hooks, instead of being placed in a dish.

STEINHEILITE. Blue quartz; a variety of *iolite*, from Orayervi in Finland.

STELLA'TÆ (*stella*, a star). *Galiaceæ.* The Madder tribe of dicotyledonous plants, characterized by their square stems, and by their verticillate leaves without stipules, presenting a star-like appearance.

STELLE'RIDÆ (*stella*, a star). A family of anenterous echinoderms, in which the radiated form is most complete and general, and in which the species have consequently received the common appellation of *star-fishes*, or *sea-stars.* They constitute the third order of the *Actinozoaria* of De Blainville.

STENELY'TRANS (στενὸς, narrow, ἔλυτρον, a wing-case). A family of coleopterous insects, comprising those in which the elytra become narrow at the posterior part of the body.

STENO'GRAPHY (στενὸς, contracted, γράφω, to write). *Brachygraphy.* The art of short-writing, or the representation of words by means of a few simple characters. Various modes of stenography have been successively employed; the best is that which employs the fewest arbitrary signs.

STEPPES. A Russian name applied particularly to the extensive plains which lie on the north-west of Asia. The greater part of what is properly called the *steppes* forms a considerable portion of the country known as Independent Tartary.

STERELMI'NTHA (στερεὸς, solid, ἕλμινς, an intestinal worm). Intestinal worms which have no true abdominal cavity, as the tape-worm. These are the *parenchymatous entozoa* of Cuvier.

STEREOGRA'PHIC (στερεὸς, solid, γράφω, to write). The term applied to that mode of projecting a sphere upon a plane, in which the eye is at a point in the sphere, and the plane of projection is the great circle of which the eye is at the pole, or a plane parallel to it. See *Projection.*

STEREO'METER (στερεὸς, solid, μέτρον, a measure). An instrument for determining the specific gravity of liquid, porous, and pulverulent, as well as of solid bodies.

STE'REOSCOPE (στερεὸς, solid, σκοπέω, to see). An instrument consisting of two plane mirrors, inclined with backs to each other, at an angle of 90°; perspective drawings of an object are placed at the sides of the mirrors, and at equal distances from them in the same horizontal line; the spectator placing his head against the edges of the two mirrors, will see a single image of the *solid* represented by the drawings.

STE'REOTYPE (στερεὸς, solid, τύπος, a type). The art of printing from cast plates of type-metal, instead of from moveable types.

STERNO'XI (στέρνον, sternum, ὀξὺς, sharp-pointed). A tribe of coleopterous insects, in which the sternum is prolonged into a point at both extremities.

STIBIUM. The old name for the ore of antimony. Hence we meet with the terms *stibious* and *stibic*, for the antimonious and the antimonic, acids.

STIGMA (στίζω, to prick). The upper, spongy, and secreting extremity of the style in plants. From its property of absorbing the fecundating matter contained in the pollen-grain, it has been termed the pistillary *spongelet.*

STILBITE. A crystallized simple lustrous mineral, usually white, one of the zeolite family, frequently included in the mass of the trap rocks. It corresponds in composition with felspar, but contains in addition 6 atoms of water.

STILPNOSIDE'RITE. A mineral allied to meadow iron-ore, said to contain phosphoric acid, occurring together with brown iron in Saxony and Bavaria.

STING OF PLANTS. A modification of the hair of plants, stiff and pungent, giving out an acrid juice when touched, as in nettle.

STINKSTONE. *Swinestone.* A variety of compact lucullite (a sub-species of limestone), emitting a fetid odour on friction. It occurs in beds in secondary limestone, alternating occasionally with secondary gypsum and beds of clay.

STIPES. A term applied to the *stem* of endogenous trees, to the stalk which supports the pileus of the mushroom, &c.

STI'PITATE (*stipes*, a stalk). Stalked; that which is furnished with a stalk, as the pappus of some composite plants. The term does not apply to the petiole of a leaf, or to the peduncle of a flower.

STIPULE (*stipula*, the husk of straw). A small leaf-like organ, attached to the base of the petiole of the leaf in many plants. In pinnate leaves there is often a pair of stipules at the base of each leaflet, as well as two at the base of the common petiole; the subordinate pairs are called *stipels.* Hence the terms *sti-*

pulate, furnished with stipules; and *exstipulate*, having no stipules.

STOLE (*stolo*, a shoot or scion). By this term some botanists have designated that kind of branch of plants, which differs from the *soboles* or *sucker* in proceeding from the stem above the surface of the earth, into which it afterwards descends and takes root, as in aster junceus. By the older botanists, a sucker was always understood by the word *stolo*, and *surculus* indicated a vigorous young shoot without branches.

STOMA'PODA (στόμα, a mouth. ποὺς, ποδὸς, foot). A group of the crustacea, in which the cephalic segment is free, and supports large pediform maxillæ. In these animals the branchiæ are attached to natatory post-abdominal feet.

STO'MATE (στόμα, a mouth). The botanical name for an oval space, lying between the sides of the cells in the epidermis of plants, and opening into a cavity in the subjacent tissue.

STONESFIELD SLATE. Slaty calcareous limestone; a constituent portion of the Lower Oolite formation, abounding in organic remains.

STOOL (*stolo*, a shoot or scion). A term applied in Botany to the parent plant from which young individuals are propagated by the process of *layering*, as it is technically called by botanists.

STOURBRIDGE CLAY. A variety of clay with the general properties of potters' clay, but of a dark colour, employed in the manufacture of crucibles. It appears to have originated from the disintegration of shale.

STRAIGHT LINE. According to Plato's definition, "a straight line is that of which the middle parts hide the extremities," the eye being placed in the continuation of the line. Archimedes defined a straight line as "the shortest distance between two points." Euclid defines it as "that which lies evenly between its extreme points." These are all very amusing definitions to *those who know* what a straight line is; for the rest, it may be sufficient to say that "a straight line is a straight line."

STRAIT. A narrow channel connecting two seas together, or a sea with the ocean, as the strait of Gibraltar.

STRATIFIED ROCKS. Rocks arranged in *strata* or beds, supposed to have been so deposited by water. Under the terms *Primary*, *Secondary*, and *Tertiary Strata*, the characters of these rocks are described. Other particulars will be found under the term *Stratum*.

STRA'TUM (*stratum*, a layer or bed, from *sterno*, to spread out). In the language of Geology, a stratum is a bed or mass of matter spread out over a certain surface by the action of water, or, in some cases, by wind. The deposition of successive layers of sand and gravel in the bed of a river, or in a canal, affords a perfect illustration both of the form and the origin of stratification. A large portion of the masses constituting the earth's crust are thus stratified, the successive strata of a given rock preserving a general parallelism to one another; but the planes of stratification are not perfectly parallel throughout a great extent, like the planes of cleavage. See *Rock*.

1. The inclination of strata from the horizontal position is called the *dip*. The direction, or line of bearing, of strata is called the *strike*, and it is indicated by a horizontal line at right angles to the dip. When strata protrude above the surface, or appear uncovered, they are said to *crop out*. They are said to be *conformable*, when their planes are parallel, whatever their dip may be; *unconformable*, when a set of strata is so connected with another, that the planes of stratification of the one series have a different direction from those of the other series. See *Fault*.

2. *Strata, recent or alluvial*. Under this term are included all those deposits which have resulted from the action of the elements, or from the progress of vegetation, in the course of the period which has commenced after the deposition of the tertiary strata, and has continued to the present day. They may be arranged under the heads of alluvial deposits, concretionary deposits, coralline deposits, and vegetable deposits. These terms will be found in their respective places.

STRA'TUS (Lat. a bed or covering). The *fall-cloud;* a primary form of cloud, which rests upon the surface of the earth. It varies in extent and thickness, and is generally formed by the subsidence of vapour in the atmosphere. This form comprises all those fogs and mists which, on summer evenings, fill the valleys, remain during the night, and disappear in the morning. Hence it has been called the *cloud of night*. The stratus must be distinguished from that variety of the cirro-stratus which resembles it in external characters: the former does not wet the objects on which it alights; the latter moistens every thing it touches.

STREAM-MEASURER. An instrument for measuring the velocity of a stream of water at different depths. One of the simplest is *Pictot's tube;* it consists of a tube bent nearly at a right angle, expanding in a funnel shape; this is placed into the direction of the stream; the upper part above the water must be of glass. If the water be in a state of rest, the level within and without the tube will be equal; but if it be in motion, the impulse of the stream will cause a column of the fluid to ascend until the weight of this column become a counterpoise to the force with which the water is impelled.

STREAM TIN. Tinstone, or native oxide of tin, occurring in rounded particles and masses mixed with other alluvial matters. The finest grain tin is procured from this ore.

STREPSI'PTERA (στρεπτὸς, twisted, πτερὸν, a wing). A singular order of Insects discovered by Mr. Kirby, in which the anterior wings are reduced to minute appendages twisted spirally.

STRI'ATED (*stria*, a streak). Marked with very slender lines, or *striæ*, either indented or elevated, at parallel and nearly equal distances. When the lines are deeper than striæ, and indented, they are called *grooves;* when still deeper and elevated, *ridges*.

STRI'GIDÆ (*strix*, the screech-owl). The Owl tribe; a family of the *Raptores*, or Rapacious birds, including all the nocturnal birds of prey, and characterized by the large proportion of the head to the body, and by the size of the eyes, which are surrounded by a fringe of feathers, most remarkable in the barn owl and its allies.

STRI'GOSE (*strigosus*, scraggy). A term applied to a surface covered with sharp, appressed, rigid hairs; a term synonymous with *hispid*.

STRO'BILE (στροβίλη, a plug of lint twisted into an oval shape like a pine-cone). *Cone*. An amentiform fruit, the carpels of which are scale-like, spread open, and bear naked seeds; sometimes the scales are thin, with little cohesion, as in the hop; but they are often woody, and cohere into a single tuberculated mass, as in the pine. See *Galbulus*.

STROBOSCO'PIC PLATES (στρόβος, a whirling round, σκοπέω, to observe). An apparatus invented by Stampfer of Vienna, by which an impression is produced on the retina of an uninterrupted line of light by the rapid motion of a luminous object. On the same principle is explained the action of the *thaumatrope*, and of Newton's coloured wheels.

STRO'MA. A fleshy body occurring in fungaceous plants, to which flocci are attached, as in isaria, &c.

STRO'MBIDÆ. Wing-shells; a family of carnivorous Gasteropods, named from the typical genus *strombus;* the outer side or lip of the aperture is considerably dilated.

STRO'MBINÆ. The true Wing-shells; a sub-family of the *Strombidæ*, having the outer lip greatly dilated, with a lobe at the base, and often on the summit also of the outer lip; the spire being always more or less elevated.

STRO'NTIANITE. Carbonate of strontia; a mineral of fibrous texture, sometimes transparent and colourless, but generally with a tinge of yellow or green.

STRO'NTIUM. The metallic base of the alkaline earth *strontia*, named from Strontian, a mining village in Argyleshire. The earth strontia is to barytes, what soda is to potash. Sulphate of strontia is known as *celestine*, and occurs in regular crystals of the same form as sulphate of barytes.

STRO'PHIOLÆ. *Carunculæ*. Irregular protuberances sometimes occurring about the umbilicus of seeds; in such cases, the umbilicus is said to be *strophiolate* or carunculate.

STRUCTURE OF ROCKS. The *structure* of rocks relates to the arrangement of their parts, viewed on a larger scale than that of their *texture*. Structure is said to be *massive*, when the rock presents no internal division into plates, prisms, or balls, but is of a uniform texture over a great extent; *prismatic* or *columnar*, when a mass of a rock is internally divided by fissures into prisms of various sizes or forms, as in basalt, greenstone, and porphyry; *tabular*, when a rock is composed of parallel plates, separated by regular seams; *globular*, when globular masses of large size are imbedded in a substance of the same nature.

STRUMA. *Bourrelet*. A dilatation of the petiole of a leaf, at the extremity where it is connected with the lamina. Also, a dilatation at the base of the sporangium of mosses.

STRUTHIO'NIDÆ (*struthio*, the ostrich). A natural family of terrestrial birds, comprising the ostrich, the cassowary, the dodo, the emu, the apterix, &c. In these birds the locomotive power resides in the lower extremities, the wings being, in the majority of cases, merely rudimentary.

STRYCHNINE. *Strychnia.* An alkali derived from the Nux Vomica class of plants, and particularly from the seeds of the *Strychnos nux vomica*, and St. Ignatius's bean, the fruit of *Strychnos ignatia.* Strychnine exists in these plants in combination with *strychnic acid.*

STU'CCO. Sulphate of lime; an artificial hydrate, having the same composition as native gypsum. When made into a paste with water, it forms a hard coherent mass, or sets, in a minute or two, with a slight evolution of heat.

STUFAS. Jets of steam issuing from fissures in volcanic regions at a temperature of ten above the boiling point.

STURIO'NES (*sturio*, the sturgeon). The Sturgeon tribe; an order of cartilaginous fishes, in which the gills hang freely, and are covered with a gill-lid having a single wide opening, as in the osseous fishes. In these fishes a large swimming-bladder exists, from which is obtained the valuable material called isinglass.

STU'RNIDÆ (*sturnus*, the starling). The Starling tribe, placed by Vigors between the Fringillidæ and the Corvidæ, in his Conirostres.

STYLE (στύλη, a pillar). In Botany, that elongation of the ovary which supports the stigma. It is frequently absent, and then the stigma is sessile on the ovary. It is not more essential to a pistil than a petiole to a leaf, a claw to a petal, or a filament to the stamen.

STYLE, OLD and NEW. By the Old Style is meant the method of computing time anterior to the reformation of the calendar by Pope Gregory XIII; and by the New Style, that which has been in use since. The reformation took place in 1582, in which ten days were deducted from the year, by calling what, according to the old calendar, would have been the 5th of October, the 15th of October, 1582. From thence to the end of February, 1700, new style is *ten* days in advance of old style: thus January 1 (O. S.) is January 11 (N. S.) and so on. From and after March 1, 1700, to the end of February, 1800, new style is eleven days in advance of old style: thus January 1 (O. S.) is January 12 (N. S.). The new style was applied in England in 1751.

STYLOSTE'GIUM (στύλη, the style, στέγω, to cover closely). *Orbiculus.* The botanical name of a peculiar appendage of the petals found in certain plants, also called *corona.* In narcissus, it forms an undivided cup, surrounding the stamens and style. When divided, its parts bear various names, as horns, beak, wings, folioles, &c.

STYRA'CEÆ. The Styrax tribe of dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* monopetalous; *stamens* of unequal length; *ovary* superior, containing cells; *fruit* drupaceous.

SUB-. A Latin preposition, denoting, 1. a position *beneath* any body; 2. a slight modification, corresponding to the English term *somewhat*, as in sub-ovate, somewhat ovate, sub-viridis, somewhat green; and 3. in chemical terms, an intermediate degree of oxidation, as in subsulphurous acid, or that which is intermediate between the sulphurous and hyposulphurous acids.

1. *Sub-altern.* In Logic, *Subaltern Species and Genus* is that which is both a species of some higher genus, and a genus in respect of the species into which it is divided. *Subaltern Opposition* is between a universal and a particular of the same quality; of these, the universal is the *subalternant*, and the particular the *subalternate.*

2. *Sub-Apennines.* Low hills which skirt, or lie at the foot of, the great chain of the Apennines in Italy. This term is applied by geologists to a series of strata of the old Pliocene period.

3. *Sub-contrary.* In Mathematics, when a figure or solid is symmetrical, so that equal lines or polygons can be drawn on two different sides, those equal lines or polygons may be termed *sub-contrary.* The two equal sides of an isosceles triangle are sub-contrary. In a right cone, every section has its sub-contrary, except only the circle which generates the cone, and its parallels.

4. *Sub-contrary opposition.* This occurs, in Logic, between two particular propositions, the affirmative and the negative. Both are true in contingent matter, but never both false. See *Opposition.*

5. *Sub-dominant.* In Music, a kind of governing note, being the fifth below the key-note. In the regular ascending scale of seven notes, it is the fourth: thus, in the key of C, F is the sub-dominant; the term, however, is derived from the relation of the note to the tonic as the fifth below.

6. *Sub-duplicate.* In Arithmetic and Algebra, the sub-duplicate ratio of two numbers is the ratio of their square roots. Thus, the sub-duplicate ratio of the numbers 9 and 16 is the ratio of 3 to 4; that of the numbers a and b is the ratio of $\sqrt{a}$ to $\sqrt{b}$.

7. *Sub-medial.* A term synonymous with *transitional,* and applied to the lower secondary rocks, which bear a close resemblance to some of the primary rocks, though differing from them in being often fragmentary, and in containing organic remains. They occur in England, Scotland, and Wales, where they compose the highest ranges, exclusive of the Grampians.

8. *Sub-multiple.* The inverse term to *multiple:* thus, 18 being a multiple of 6, 6 is a sub-multiple of 18. The term *sub-multiple* is equivalent to *aliquot part.* It is such a part of a quantity as can be expressed by a whole number, as a third, a fourth, &c.

9. *Sub-normal.* In Geometry, the sub-normal is that part of the axis of a curve line which is intercepted between the ordinate and the normal. It is a third proportional to the sub-tangent and the ordinate.

10. *Sub-oxide.* By some chemists the oxides of the mineral kingdom are termed *sub-oxides* and *super-oxides;* according to this system of nomenclature, the former term denotes the base, the latter the acid, and the quantities of oxygen are found in a simple numerical proportion.

11. *Sub-resin.* The name given by Bonastre to that portion of a resin which is soluble only in boiling alcohol, and is thrown down again as the alcohol cools, forming a kind of seeming crystallizations. It is a sort of *stearine of resins.*

12. *Sub-salt.* A salt which has assumed a fixed metallic oxide in the place of crystallization. Such compounds may, therefore, be truly neutral in composition, the excess of oxide not standing in the relation of base to the acid. The term 'sub-salt' originally denoted a salt which contained an excess of base.

13. *Sub-stratum.* A stratum lying under another stratum, as clay under gravel. The term *sub-soil* is generally applied to the matters which intervene between the surface soils and the rocks on which they rest.

14. *Sub-tangent.* In Geometry, the sub-tangent is that part of the axis of a curve which is intercepted between the tangent and the ordinate.

15. *Sub-tense.* A line, angle, &c. which *subtends,* or is opposite to, another line, angle, &c. Thus, the cord of a segment is the sub-tense of the arc which it cuts off from the circle.

SU'BERIC ACID (*suber,* the cork tree). An acid procured by the action of nitric acid, with heat, upon barks, but more particularly cork. It forms salts called *suberates.*

SUBJECT and OBJECT. These are correlative terms employed by philosophical writers, the former denoting the mind, soul, or personality of the thinker —the Ego, or self; the latter, expressing any thing or every thing external to the mind, and distinct from it—the non-Ego, or not-self. The universe itself when considered as a unique existence, is an object to the thinker; and the very subject itself (the mind) can become an object, by being psychologically considered.

Secondary meaning. These terms gradually lost their primary signification. *Object* became metaphorically *motive, end, final cause,* &c., by a common change in all language, of the metaphor into a real signification. *Subject* also became synonymous with object, and probably the logical term "subject of predication" facilitated this confusion. Be this as it may, the extreme want of precision with which the words are used, may be seen in the very common instance of calling any thing "a subject of investigation." *Pen. Cycl.*

SUBJECT of a PROPOSITION. In Logic, that term of a proposition of which the other is affirmed or denied. See *Predicate.*

SUBJUNCTIVE MOOD. The following is Mr. Greenlaw's rule on the use of this mood:—"If a clause be the *true* subject of a proposition, or be properly attached to the *true* subject, the verb of such clause is in the indicative mood; but if a clause be the *true* predicate of a sentence (provided it does not contain the copula blended with the verb), or if it be properly attached to the *true* predicate, the verb of such clause is invariably found in the subjunctive mood." See *Potential Mood.*

SUBLIMATION. The process by which volatile substances are *raised* by heat, and again condensed into the solid state; it is, in fact, dry distillation. The substances so obtained are called *sublimates.*

SUBLIME GEOMETRY. By the older mathematicians this term was technically applied to the higher parts of geometry, in which the infinitesimal calculus, or something equivalent, was employed.

SUBSIDIARY. A quantity or symbol is so called when it is not essentially a part of a problem, but is introduced to help in the solution. The term is particularly applied to those angles, which are introduced into trigonometrical problems, in which there is no question of angular quantity.

SUBSTANCE. In Physics, substance is synonymous with *matter*. In metaphysics, it is that which supports, or, literally, *stands under* phenomena; it is the fundamental fact of all existence, though as inconceivable as a *point* in mathematics.

SUBSTITUTION, CHEMICAL. A term explanatory of certain phenomena connected with chemical affinity. When carbonate of soda is added to nitrate of lime, carbonate of lime is instantly formed and precipitated, while nitrate of soda is formed at the same time, and remains in solution. Here a double substitution occurs, lime being substituted for soda in the carbonate, and soda for lime in the nitrate. Such reactions may, therefore, be truly described as *double substitutions* as well as double decompositions. The substitution of chlorine for hydrogen in many organic substances has been found to take place with remarkable uniformity.

SUBTRACTION. The arithmetical operation of removing one number or quantity from another, in order to find their difference. The operation is precisely the reverse of addition. The quantity to be diminished was formerly called the *minuend;* the quantity to be removed, the *subtrahend;* and the remaining quantity or difference, the *remainder.*

SUCCINIC ACID (*succinum*, amber). An acid derived from the distillation of amber, and found also in the resin of some coniferous plants. Its compounds with the salifiable bases are called *succinates.*

SUCKER. *Surculus.* A term applied in Botany to a modification of the aerial stem, consisting of a branch which proceeds from the neck of a plant beneath the surface of the ground, and becomes erect as soon as it emerges from the earth, producing leaves and branches, and subsequently roots. It has been termed *soboles.*

SUCTION (*sugo*, to suck). The act of sucking; a term applied to the raising of liquids through a tube, by means of a piston, which lifts and sustains the weight of the atmosphere from that part of the well which is covered with the tube, leaving it to press on the other parts of the surface. See *Pump.*

SUCTO'RIA (*sugo*, to suck). A class of articulate animals, which have their mouth adapted for sucking fluid aliment. The following orders are founded on differences of the general form of the body :—

1. *Cystica*, or those destitute of an anal aperture, which have one or more buccal orifices leading into a terminal cyst.

2. *Cestoidea*, or those with a long, depressed, flat, articulated form, without anal aperture.

3. *Trematoda*, or those with a short, broad, depressed body, without distinct anus, and with one or more orifices, leading into a ramified alimentary canal.

4. *Acanthocephala*, or those with an elongated cylindrical body, with the anterior part closely covered with small sharp spines; the oral aperture leading to a ramified alimentary canal destitute of anal opening.

5. *Nematoidea*, or those with a long, cylindrical and often filiform, naked, inarticulated body traversed by a straight alimentary canal open at both ends, and with distinct sexes and internal impregnation.

6. *Epizoa*, or those of a more short and entomoid form, with a sub-articulated trunk, a biforate intestine, with rudimentary mandibles, palpi, proboscis, and sometimes antennæ and eyes.—*Grant.*

SUFFIX (*suffigo*, to fasten). A term applied by some mathematicians to the *index* written under letters, as in a_2, a_3, &c.

SUFFRUTEX. An under-shrub; a plant which differs from the *frutex*, or shrub, in its perishing annually, either wholly or in part; and from the *herb*, in having branches of a woody texture, which frequently exist more than one year, as in the Tree Mignonette.

SU'IDÆ (*sus, suis*, a sow). The Pig tribe; a group of pachydermatous animals, having four toes on each foot, and three sorts of teeth in each jaw.

SULPHAMIDE. A compound exactly analogous to oxamide, containing the radical sulphurous acid, combined with amidogen. See *Amides.*

SULPHATES and SULPHITES. The former of these bodies are definite compounds of sulphuric, the latter of sulphurous, acid with the salifiable bases.

SULPHATOXYGEN. According to the new view of compound radicals, this body is the *sulphate radical* of sulphate of soda, the oxygen of the soda being referred to the acid; its compounds are termed *sulphatoxide.*

SULPHO-SALTS. These are merely *double sulphurets,* in the constitution of which Berzelius has traced a close analogy to salts. The sulphurets of the most electro-positive metals have been termed *sulphur bases,* whilst the sulphurets of arsenic, antimony, &c. have been called *sulphur acids:* the combination of these bases and acids are *sulphur salts.*

SULPHOVINIC ACID. *Œnothionic acid.* An acid formed by the action of sulphuric acid upon alcohol.

SULPHUR. *Brimstone.* An elementary substance exhaled in large quantities from volcanoes, either in a pure state or in combination with hydrogen; by condensing in fissures it forms *sulphur veins,* from which the greater part of the sulphur of commerce is derived. It exists also in combination with metals, and is extracted in considerable quantity from bisulphuret of iron or *iron pyrites.* It is likewise a constituent of sulphuric acid in gypsum and other native sulphates. Lastly, it enters into organic structures, being associated with albumen, in the fluid or the solid state.

Crude Sulphur is the result of the distillation of native sulphur; *roll or stick sulphur* is sulphur which has been refined and cast into wooden moulds; *flowers of sulphur* is the name given to sulphur which has been sublimed, in the form of a bright yellow powder.

SULPHURET. A combination of sulphur with a base. A sulphuret is sometimes distinguished by the *colour* of the compound, as the black and the red sulphuret of mercury.

SULPHURIC ACID. An acid produced by the burning of sulphur, mixed with nitrate of potash. It was formerly called *oil of vitriol,* because it was distilled from a substance of mineral origin, called *vitriol* on account of its imperfect resemblance to green glass. This acid, when obtained in the latter way, emits white vapours on exposure to the air, and is hence called *fuming sulphuric acid.*

SULPHUROUS ACID. A gas obtained by burning sulphur in dry air or in oxygen gas. By means of nitric acid, the sulphurous is immediately converted into sulphuric acid.

SUN. The centre of the solar system, and the dispenser of light and heat to all the planets. Its distance from the earth is computed at 95 millions of miles, its diameter at 882,000 miles, and its bulk is about *thirteen hundred thousand* times greater than that of the earth.

SUN-STONE. A yellow variety of *adularia,* or naker felspar, with reddish dots. This name is also sometimes given to the beautiful avanturino variety of common felspar.

SUPERDOMINANT. The sixth of the key, in the descending scale of Music. The *supertonic* is the second above the key-note.

SUPERFICIES. Popularly, the *surface* of any thing. In Geometry, it denotes the boundary of a solid, and relates to the two dimensions of length and breadth. The quantity of an area is called its *superficial* content, as distinguished from *linear* content or length, and from *solid* content or bulk. See *Surface.*

SUPERPOSITION. The process, in Geometry, by which one magnitude may be conceived to be placed upon another, so as exactly to cover it, or so that every part of each shall exactly coincide with every part of the other. It is evident that any magnitudes which admit of superposition must be equal, or, rather, this may be considered as the definition of equality.

SU'PER-SALT. A compound of an acid and a base, in which the acid is in excess. See *Sub-salt.*

SU'PPLEMENT. In Trigonometry, the *supplement of an arc* is its defect from a semicircle; the *supplement of an angle,* its defect from two right angles, or 180°. Also, chords or arcs of a circle or other curve which have a common extremity, and together subtend an angle of two right angles at the centre, are sometimes called supplemental chords or arcs. The supplemental versed sine, or *suversed sine* is the difference between the versed sine and the diameter.

SUPRACRETACEOUS ROCKS. A term applied by geologists to certain rocks or strata which are situated above the chalk. They are also termed *tertiary strata.*

SURD. This term denotes, in Algebra, an *irrational* or *incommensurable* quantity, or a quantity of which the root cannot be exactly determined. It is not, in fact, a *complete power*, and it must therefore be expressed either by the *radical sign*, or by its *fractional index*. Thus the square root of 2 must be expressed either by $\sqrt{2}$, or by $2^{\frac{1}{2}}$; the cube root of 3, by $\sqrt[3]{3}$, or by $3^{\frac{1}{3}}$; the n the root of $a + b$, by $\sqrt[n]{a + b}$, or by $(a + b)^{\frac{1}{n}}$. The etymology of the term *surd* is unknown.

SURFACE. *Superficies.* In Geometry, a *plane* surface is such that the right line, which joins every two points which can be assumed upon it, lies entirely in the surface. By Plato it was defined to be a surface whose extremities hide all the intermediate parts, the eye being placed in its continuation. It has been also defined as "the smallest surface which can be contained between given extremities." Every surface which is not a plane, or composed of planes, is called a *curved* surface. All plane surfaces are perfectly alike in their properties, but curved surfaces admit of endless variety.

1. *Surfaces of the first order* are those in which the equation is of the first degree, containing only plane surfaces. *Surfaces of the second order* are those in which the equation is of the second degree; these surfaces hold the same place among surfaces as is held by curves of the second degree, or conic sections, among curves; and every section made by a plane with any surface of the second degree must be a curve of the second degree. The surfaces of the second degree are the ellipsoid, the single and the double hyperboloid, the elliptic paraboloid, and the hyperbolic paraboloid.

2. *Cylindrical surfaces* are those generated by a straight line infinitely produced in both directions, which moves so as always to be parallel to a given line, and to have one of its points on a given curve.

3. *Conical surfaces* are generated by a straight line infinitely produced in both directions, which always passes through a given point or vertex, and has one point in a given curve. The common cylinder and the cone would be described in this science as a *right circular cylinder* and a *right circular cone.* The cylindrical surfaces themselves are only an extreme case of the conical surfaces, being what the latter become when the vertex is removed to an infinite distance.

4. *Surfaces of revolution* are generated by the rotation of a curve about an axis, relatively to which it always retains one position. The common cone and cylinder, the sphere, and others of the greatest practical use, are contained in this class.

5. *Tubular surfaces* are generated by a circle of given radius, which moves with its centre on a given curve, and its plane at right angles to the tangent of that curve. When the given curve is a circle, the tubular surface is a common ring.

6. *Ruled surfaces* (the 'surfaces réglées' of the French writers) are those which are described by the motion of a straight line, which neither remains parallel to a given line, nor always passes through a given point. This includes, among many others, the whole class of *conoidal surfaces*, made by a straight line which moves parallel to a given plane, and always passes through a straight line perpendicular to that plane and a given curve. The surface of a spiral staircase, as it would be if there were no steps, but only a gradual ascent, is an instance.

7. *Developable surfaces* are those which can be unwrapped on a plane without any doubling of parts over one another, or separation; that is, without being rumpled or torn. The only familiar instances are the cylinder and the cone.—*Pen. Cycl.*

8. *Surface gauche.* The name given by the French geometers to a surface which cannot be developed on a plane, the generating straight line being constrained to move so that no two of its consecutive positions are in the same plane.

SURSOLID. In Arithmetic, the fifth power of a number. Thus 32 is the sursolid of 2.

SU'RTURBRAND. The name given in Iceland to brown coal or bituminous wood; a variety of coal which retains the structure of wood unchanged, and resembles peat in the phenomena produced during combustion. This is called in Devonshire *Bovey coal.*

SUSPE'NSION. A term applied to the state of solid bodies, the particles of which are held undissolved in water, and may be separated from it by filtration. The solid is then said to be *suspended* in the liquid.

SUSSEX MARBLE. A variety of

limestone constituting one of the fresh-water deposits of the Wealden group, and occurring in layers varying from a few inches to upwards of a foot in thickness, the layers being separated by seams of clay or of friable limestone.

SUTURE (*sutura*, a seam). 1. A term applied, in Botany, to the junction of the valves of a simple carpel, as of the legume. The junction corresponding to the margins of the carpellary leaf, is called the *ventral suture;* that which corresponds to the midrib of the carpellary leaf, is the *dorsal suture.* 2. In Malacology, the term *suture* is applied to the line of junction in the whorls of spiral shells, or to that line by which two parts join or fit into each other. 3. In Entomology, it is the line at which the elytra meet and are sometimes confluent.

SYCHNOCA'RPOUS (*συχνὸς*, frequent, *καρπὸς*, fruit). *Polycarpous.* A term used in Botany to signify the duration of vegetable existence, and denoting the power of bearing fruit many times without perishing. Those plants whose stem endures many years, constantly bearing flowers and fruits, as trees and shrubs, are designated as *caulocarpous;* while those whose root endures many years, but whose stems perish annually, as herbaceous plants, are called *rhizocarpous.*

SY'CONUS (*σῦκον*, a fig). The Botanical name of an aggregate fruit, consisting of a fleshy rachis, having the form of a flattened disk, or of a hollow receptacle, with distinct flowers and dry pericarps, as in the fig, the dorstenia, &c.

SY'ENITE. A variety of granite containing hornblende instead of mica, and so called from its being brought from Syene in Egypt.

SY'LLOGISM (*συλλογισμὸς*, a reckoning all together; reasoning). A demonstrative argument, in which a conclusion is deduced by comparison of its terms with a middle term. It is a strictly logical form of argument, the conclusiveness of which is manifest from the structure of the expression alone, without any regard to the meaning of the terms. Thus—

> All tyrants deserve death;
> Cæsar was a tyrant;
> *Therefore* he deserved death.

SY'LVANITE. Native tellurium, found in some of the Transylvanian ores.

SY'LVIADÆ (*sylvia*, the warbler). The Warblers; a family of the Insessores, or perching birds, or the Cantatrices of Macgillivray, characterized by their small size, none of them much exceeding the nightingale. Most of them are migratory. See *Dentirostres.*

SYMBOLS, CHEMICAL. An abbreviated mode of expressing the composition of bodies. The elementary substances, instead of being written at full length, are indicated by the first letter of their names, a second letter being employed when more than one substance begins with the same letter,—thus C stands for carbon, Al for aluminium, As for arsenic, &c. These symbolic expressions, or *chemical formulæ*, are given in the subjoined table.

TABLE OF SYMBOLS.

Elements.	Sym.	Elements.	Sym.	Elements.	Sym.
Aluminium	Al	Gold (Aurum)	Au	Potassium (Kalium)	K
Antimony (Stibium)	Sb	Hydrogen	H	Rhodium	R
Arsenic	As	Iodine	I	Selenium	Se
Barium	Ba	Iridium	Ir	Silicium	Si
Bismuth	Bi	Iron (Ferrum)	Fe	Silver (Argentum)	Ag
Boron	B	Lead (Plumbum)	Pb	Sodium (Natrium)	Na
Bromine	Br	Lithium	L	Strontium	Sr
Cadmium	Cd	Magnesium	Mg	Sulphur	S
Calcium	Ca	Manganese	Mn	Tellurium	Te
Carbon	C	Mercury (Hydrargyrum)	Hg	Thorium	Th
Cerium	Ce	Molybdenum	Mo	Tin (Stannum)	Sn
Chlorine	Cl	Nickel	Ni	Titanium	Ti
Chromium	Cr	Nitrogen	N	Tungsten (Wolfram)	W
Cobalt	Co	Osmium	Os	Vanadium	V
Columbium Tantalum	Ta	Oxygen	O	Uranium	U
Copper (Cuprum)	Cu	Palladium	Pd	Yttrium	Y
Fluorine	F	Phosphorus	P	Zinc	Zn
Glucinium	G	Platinum	Pl	Zirconium	Zr

1. Each symbol represents one equivalent of the elementary substance: thus H denotes one equivalent of hydrogen. A figure prefixed multiplies the symbol: thus $2\,\mathrm{H}$, $3\,\mathrm{H}$, $4\,\mathrm{H}$, denote two, three, and four equivalents, respectively. Two equivalents are sometimes denoted by placing a dash through, or under, the symbol: thus Ħ, or $\underline{\mathrm{H}}$, signifies the same as $2\,\mathrm{H}$, or two equivalents.

2. *Compounds* are represented by placing the symbols of their elements together. Thus, $\mathrm{S\,Fe}$ denotes sulphuret of iron. Or the compound may be expressed by an algebraic formula, as $\mathrm{S} + \mathrm{Fe}$.

3. A dot (·) *prefixed to*, or *placed over*, a symbol, indicates one equivalent of *oxygen*. Thus $\cdot\mathrm{H}$ or $\dot{\mathrm{H}}$ denotes one equivalent of oxygen and one of hydrogen, or $\mathrm{H} + \mathrm{O}$. Each additional dot denotes another equivalent: thus, $:\mathrm{C}$, or $\ddot{\mathrm{C}}$, denotes one equivalent of carbon and two of oxygen, or carbonic acid; $:\vdots\mathrm{N}$, or $\overset{:\cdot:}{\mathrm{N}}$, denotes one of nitrogen and five of oxygen, or nitric acid.

4. A figure *prefixed to* any symbols multiplies all the following symbols which are not separated from it by a + sign. Thus $2\cdot\mathrm{H}\,\vdots\mathrm{S} = 2\cdot\mathrm{H} + 2\,\vdots\mathrm{S}$; in this case, the compounds $\cdot\mathrm{H}$ and $\vdots\mathrm{S}$ are both multiplied by 2. But in the following formula,

$$2\cdot\mathrm{H}\,\vdots\mathrm{S} + \cdot\mathrm{K} = 2\cdot\mathrm{H} + 2\,\vdots\mathrm{S} + \mathrm{K},$$

the two first compounds only are multiplied by 2, the third being merely added.

5. A figure *placed after* any symbol multiplies that symbol, but does not effect any other symbol in the formula. Thus, $\mathrm{H}^2\,\mathrm{C} = 2\,\mathrm{H} + \mathrm{C}$; in this case, H is multiplied, while C is only added. In the formula, $\mathrm{N\,H}^3 = \mathrm{N} + 3\,\mathrm{H}$, the latter symbol alone is multiplied.

6. In complicated combinations, *brackets* are often used to contain the symbols which are supposed to be united. Thus, in the formula

$$[2\,\mathrm{H\,C}^2\,\mathrm{N} + \mathrm{C}^2\,\mathrm{NFe}] + 2\cdot\mathrm{K},$$

there are two compounds; the former is composed of the symbols within the brackets, the latter consists of the symbols placed outside the brackets.

7. A figure *prefixed to any number of symbols enclosed within brackets*, multiplies them all, whether there are intervening signs or not. A figure prefixed to the symbols within the brackets in the preceding paragraph, multiplies them all, but does not effect the symbol outside the brackets.

8. The animal and vegetable acids were expressed by Berzelius by the first letter of their names, with a dash over it: thus $\bar{\mathrm{T}}$, $\bar{\mathrm{A}}$, $\bar{\mathrm{C}}$, are the symbols for tartaric, acetic, and citric acids. By others, they are represented by *Italic* capitals, some succeeding letter being added when more than one acid have the same initial letter: thus *T*, *A*, *Ct*, represent the acids above mentioned.

9. A few *exercises on symbols* are here added. To the left of the sign (=) are placed the materials used; to the right, the products formed by their reaction. The symbol '&' is used to signify a substance added to, or separated from, another, while + is placed between substances chemically combined:

Materials.		*Products.*
$\cdot\mathrm{H}\;\&\;\mathrm{Fe}$	=	$\cdot\mathrm{Fe}\;\&\;\mathrm{H}$
$\cdot\mathrm{H}\;\&\;\mathrm{Fe}\;\&\;\vdots\mathrm{S}$	=	$\vdots\mathrm{S}\cdot\mathrm{Fe}\;\&\;\mathrm{H}$
$:\mathrm{Hg}$	=	$\mathrm{Hg}\;\&\;\mathrm{O}^2$
$2:\mathrm{Mn}$	=	$\vdots\mathrm{Mn}^2\;\&\;\mathrm{O}$
$5\cdot\mathrm{N}^2\;\&\;\mathrm{P}^2$	=	$:\vdots\mathrm{P}^2\;\&\;10\,\mathrm{N}$
$4\cdot\mathrm{N}^2\;\&\;\mathrm{S\,Fe}$	=	$\vdots\mathrm{S}\cdot\mathrm{Fe}\;\&\;8\,\mathrm{N}$
$:\vdots\mathrm{N}$	=	$\cdot\vdots\mathrm{N}\;\&\;\mathrm{O}$
$2:\vdots\mathrm{N}\;\&\;:\mathrm{N}$	=	$3\cdot\vdots\mathrm{N}$
$\mathrm{S}\;\&\;\mathrm{O}^2$	=	$:\mathrm{S}$
$\mathrm{HS}\;\&\;\mathrm{O}_3$	=	$\cdot\mathrm{H}\;\&\;:\mathrm{S}$
$A\cdot\mathrm{Pb}\;\&\;\mathrm{Z}$	=	$A\cdot\mathrm{Z}\;\&\;\mathrm{Pb}$
$:\mathrm{C}\cdot\mathrm{Pb}\;\&\;\mathrm{HS}$	=	$\cdot\mathrm{H}\;\&\;\mathrm{S\,Pb}\;\&\;:\mathrm{C}$

SY'MMETRY (*σύμμετρος*, commensurable). The etymological meaning of this term, and the meaning with which it was first employed, in mathematics, by Euclid, is *commensurability:* two magnitudes, then, were symmetrical which admitted of a common measure; hence, the term was applied to magnitudes which coincide.

1. But *Coincidence* had been already denoted by the terms *equal* and *similar*, the former relating to size, the latter to form. *Symmetry*, therefore, was eventually employed to express that obvious relation of equal and similar figures, which refers to their *position* merely, and consists in their corresponding portions being similarly placed on *different sides* of the same straight line. In the letter W there is a want of symmetry, but not in O: to make W symmetrical, both the inner lines should be thin, and both the outer lines thick.

2. In Algebra, a *function* is said to be *symmetrical* with respect to any two letters, when it would undergo no change

if these letters were interchanged, or if each were made to take the place of the other.

3. In Mathematical language, the term *symmetry* denotes that quantities which in any manner have a common relation, should have something common in the symbols of notation; and analogy is, perhaps, a better word than symmetry.—*Pen. Cycl.*

SYMPATHETIC INK. A solution of chloride of cobalt. The characters made on paper with this preparation, when dry, will be invisible; on being held to the fire, the writing will assume a bright blue or green colour; as the paper cools, the colour will again disappear, in consequence of its absorbing moisture from the air; and the phenomenon may be reproduced many times in succession.

SYMPATHETIC SOUNDS. A term expressive of that natural relation of sounds which occurs in *harmonical* combinations, and is particularly illustrated by the sounds of the Æolian harp. The term is also applied to sounds produced in one instrument by sounding another close to it; but these are dependent, not on sympathy, but on the *vibrations* of the intervening air.

SYMPIESO'METER (*συμπιέζω*, to compress, *μέτρον*, a measure). An instrument for measuring the weight of the atmosphere by the compression of a column of gas.

SYN- (*σύν*). A Greek preposition, signifying *with, together.* For the sake of euphony, the final *n* of the preposition is changed into *m* before the labials b, m, p, ph, ps, &c., as in symmetry, sympathy, &c.; into *s, l, r,* before these letters, as in syllable, &c.; and is entirely omitted when followed by two consonants, or a double one, as in syzygy.

SYNCA'RPIUM (*σὺν*, together, *καρπὸς*, fruit). The botanical designation of an aggregate fruit, in which the ovaries cohere into a solid mass, with a slender receptacle, as in magnolia, anona, &c.

SYNCA'RPOUS (*σὺν*, together, *καρπὸς*, fruit). A term applied, in Botany, to those fruits in which the carpels cohere together, as in poppy; when the carpels are distinct from one another, the fruit is termed *apocarpous*, as in ranunculus.

SYNCATEGOREMA'TIC (*συγκατηγόρημα*, that which is said, or can be said, of a person or thing along with other words). In Logic, syncategorematic words are such as cannot singly express a term, but only a part of a term; these are adverbs, prepositions, &c., and also nouns in any other case besides the nominative.

SY'NCHRONOUS (*σὺν*, together, *χρόνος*, time). That which occurs in equal times, as the strokes of the pulse; a term synonymous with *isochronous.*

SYNDA'CTYLES (*σὺν*, together, *δάκτυλος*, a toe). A group of birds which have the external toe nearly as long as the middle one, and united to it as far as the second joint. The group contains the bee-eaters, the king-fishers, the hornbills, the motmots, and the todies.

SYNGENE'SIOUS (*σὺν*, together, *γένεσις*, growth). A term applied to the anthers of plants which grow together by their margins, as in the Compositæ. A more precise term is *syn-antherous.*

SYNGNA'THIANS (*σὺν*, together, *γνάθος*, a jaw). A family of lophobranchiate fishes, in which the lengthened jaws are united by a surrounding integument, forming a tubular mouth; they are named from the genus *syngnathus*, or the pipe-fish. The name is also applied to an order of myriapodous insects, comprising the Scolopendridæ and the Geophilidæ.

SYNODICAL PERIOD (*σύνοδος*, a conjunction of paths). The simplest instance of a synodical period is afforded by the two hands of a watch: the minute hand revolves in one hour, the hour hand in twelve hours; but the *synodic* revolution of the two hands is the interval which elapses between any time at which they are together, and the next time at which the same thing takes place. This term is applied in astronomy to the lunar month, or the period of a revolution of the moon round the earth from one *synod*, or conjunction with the sun, to another; thus, taking the sun's actual revolution at 365¼ days, and the moon's at 27¼ days, we have

$$\frac{365\frac{1}{4} \times 27\frac{1}{4}}{365\frac{1}{4} - 27\frac{1}{4}} = 29\tfrac{1}{2} \text{ days nearly.}$$

SYNTAX (*σὺν*, together, *τάξις*, arrangement). That part of grammar, which shows how *individual words*, the materials of language (the department of etymology), are to be arranged together, so as to form *sentences*, or affirmations containing sense.

SYNTHESIS (*σύνθεσις*, a putting together). This term denotes *composition*, and expresses a process the very reverse of analysis, or *resolution.* The term Analysis is given to a species of mathematical investigation, which commencing with the assumption of that which is *sought* as if it were *given*, a chain of relations is pursued which terminates in what is *given* (or may be obtained) as if it were sought. The term Synthesis denotes a process in which the series of relations exhibited commences with what is given, and ends with what is sought. Consequently *analysis* is the instrument of invention, and *synthesis* that of instruction. See *Analysis.*

Synthesis, chemical. The formation of any body by combination of its elements, as opposed to *analysis*, or the resolution of a body into its component parts. In the analytic operation, a portion of water is separated, by means of galvanism, into the two elementary gaseous bodies, oxygen and hydrogen; in the synthetic operation, these two gases are again made to combine, by means of the electric spark, and a portion of water is again produced.

SYRINGE (*σύριγξ*, a pipe or tube). The common *squirt*, or *hand-syringe*, consists of a cylinder or barrel, furnished with an accurate piston; at the end of the barrel is a short suction-pipe; there is no valve. The action of the atmospheric pressure is the same as in the suction-pump (see *Pump*). The water which is raised into the barrel is driven thence into the suction-pipe, and projected into the air by mechanical force. The act of respiration, of suction by the mouth, of drinking, of smoking, &c., may all be explained by reference to the same principle.

SY'RPHIDÆ. A family of dipterous insects, belonging to the section Athericera, named from the genus *syrphus*, and closely resembling the wasps and humming-bees.

SYSTEM (*σύστημα*, a whole compounded of several parts). A harmonious arrangement of bodies with respect to one another, and of the laws by which their motions, functions, or developments are supposed to be regulated. See *Hypothesis.*

SYZYGY (*συζυγία*, union). The name given in common to the moon's opposition to, and her conjunction with, the sun. The *quadratures* are the positions precisely intermediate between the syzygies; at new and full moon the moon is in her syzygies; at half moon, in her quadratures. See *Phases* and *Quadrature.*

T

TABA'NIDÆ. The Gad-fly tribe; a family of dipterous insects, belonging to the section of Tanystoma, and distinguished by their powers of perforating the skin and sucking the blood of various quadrupeds, and even of man.

TABASHEER. A siliceous substance found in the joints of the bamboo, sometimes fluid, but generally in a concreted state. In foreign countries it is termed *bamboo milk*, salt of bamboo, and bamboo camphor. The word is derived from the Persian *scher*, or the Sanscrit *kschirum*, signifying milk.

TABLE-LAND. An elevated plain rising abruptly from the general level of the country, and being, as it were, the broad and horizontal, or gently undulating top of an immense mountain, as the Nilgherry district of India. Sometimes there are several such plains placed one upon another, at least on one or two sides, when they are called *platforms* or *terraces*, as those on the eastern slope of the Cordillera of New Mexico.

TABLE-LAYERS. This term is applied by geologists to extended plates of rock, not divided into parallel laminæ. Dr. MacCullock proposes to call them *pseudo-strata.* Mr. Bakewell remarks on what he calls the *stratiform* structure, that many masses of rock, not really stratified, occur divided into parallel planes, by seams or divisions which resemble those found in regular strata; such planes have not been super-imposed in succession, but are the result of a crystalline arrangement of the mass.

TABULAR SPAR. *Table Spar.* Another name for prismatic augite, a mineral occurring in primitive rocks, associated with brown garnets.

TABULAR STRUCTURE. A term expressing the geological character of a rock which is composed of paralled plates or tables, separated by regular seams.

TACHO'METER (*τάχος*, velocity, *μέτρον*, a measure). An instrument invented for the purpose of indicating minute variations in the velocity of machines.

TACHYDRO'MIANS (*ταχὺς*, rapid, *δρόμος*, a course). A term applied to a family of wading birds, of which the genus *tachydromus* is the type; also to a family of saurian reptiles, and to a family of dipterous insects.

TA'CHYLITE. A mineral which resembles obsidian, and has also been supposed to be similar to isopyre. It occurs in small masses in basalt and wacké.

TACKING. A nautical term for an operation with the rudder and sails, by which, when a ship is proceeding in the course of an acute angle with the direction of the wind on one of her bows, her head may be turned towards the wind, so as to enable her to sail on a course making nearly the same angle with its direction on the other bow.

TA'GLIA. A name, borrowed from the Italian, for a particular combination of pulleys. The term is applied either to a system of fixed pulleys collected in one common block; or to a system of moveable pulleys in a separate block, to which the weight is attached. Several taglias may be so combined that one acts upon another; this arrangement constitutes a *compound taglia.*

TALC. A simple mineral, laminated like mica, and often similar in colour. It is easily distinguished from this mineral by being much softer, and, although flexible, not elastic. It occurs as a constituent of certain rocks.

TALC-SLATE. A talcose rock, consisting of talc and quartz arranged in laminæ; it is of various colours, glistening, and has an unctuous feel. It is generally associated with steatite, asbestus, actinolite, and serpentine.

TALCITE. A rare mineral, called *nacrite* by Jameson, and *earthy talc* by Werner. It occurs in veins, with sparry limestone and galena, in the mining district of Freyberg.

TALCOSE GRANITE. *Protogene.* A mixture of felspar, quartz, and talc or chlorite. It occurs in Cornwall, where, on decomposing, it yields the China-clay or Porcelain-earth, which is annually exported in large quantities.

TALCOSE ROCKS. These resemble the micaceous rocks, and comprise chlorite-slate, talc-slate, and serpentine.

TA'LPIDÆ (*talpa*, a mole). The Mole tribe; a family of the insectivorous vertebrata, characterized by their subterranean habits.

TALUS. A term applied to a sloping heap, formed of fragments broken off by the action of the weather from the face of a steep rock, and accumulated at its base. The word *talus* is borrowed from the language of fortification, in which it denotes the outside of a wall of which the thickness is diminished by degrees, as it rises in height, to make it the firmer.

TA'NGENT (*tango*, to touch). A straight line which *touches*, but does not cut, a curve. A straight line is said to be a *tangent* to a circle, when it touches the circumference only on one point, making a right angle with the radius at the point of contact. In Mechanics, a force, which acts upon a wheel in the direction of such a line, is said to be *tangential;* and it is in this direction that motion is communicated between wheels and pinions, or from one wheel to another.

1. *Tangent of an angle or arc.* A line drawn from that extremity of the arc through which the diameter of the circle passes (which extremity is called the beginning of the arc) perpendicular to that diameter, touching the circle, but not cutting it, and terminated by the radius of the circle produced, and passing through the other extremity of the arc.

2. *Tangential plane.* A plane which touches a curvilineal solid. It is from this plane that we measure the *angles of incidence* on the tangential point, whether the impinging ray be *reflected* or *refracted.*

3. *Tangential force.* Another term for *centrifugal force.* Thus, when two forces act upon a body,—the *centripetal* attracting the body towards the centre of gravity, the *tangential* driving it in another direction, there will result a curvilinear motion around the central point.

TANNIC ACID. A tribasic acid occurring in the bark of all the varieties of Quercus and many other trees, and in gall-nuts, from which it is procured in greatest purity. What is commonly called *tannin* is tannic acid mixed with some foreign matters.

TA'NTALUM. *Columbium.* A metal found in the two Swedish minerals, *tantalite* and *yttrotantalite.* Its name is derived from the insolubility of its oxide in acids, in allusion to the fable of Tantalus.

TANTALUM ORE. *Columbite of Hatchett.* A prismatic ore of tantalum, occurring as a coarse red granite in Finland.

TA'NTALUS'S CUP. A philosophical toy, for exhibiting the principle of the siphon. The siphon is placed in a cup, and its legs are concealed by the hollow figure of a man whose chin is on a level with the bend of the siphon, so that the figure stands, like Tantalus in the fable, up to the chin in water, but unable to quench his thirst.

TANY'STOMA (τανύω, to stretch, στόμα, the mouth). A section of dipterous insects, which have a projecting proboscis, with the last joint of the antennæ undivided. To this section belongs the Gad-fly tribe.

TAP-ROOTED. *Fusiform.* A designation of that kind of root which consists of one fleshy elongated centre tapering to the extremity. This is termed *pivotante* by the French.

TA'PIRIDÆ. The Tapir tribe; a group of *Pachydermatous* animals, differing from the Suidæ, or Pig tribe, in the presence of only three toes on each hind foot, and sometimes also in the front, and in the absence of a central cleft of the foot.

TAPITE'LÆ (*tapetum*, a carpet, *tela*, a web). A family of spiders, which spin great webs of a close texture like hammocks, and wait for the insects which may be entangled therein.

TA'RDIGRADA (*tardus*, slow, *gradus*, a step). A group of the *Edentata*, or toothless animals, distinguished from the true edentata by the peculiar shortness of the muzzle. They are characterized by the slowness of their motion, and contain the *sloths*, in which Cuvier observes that "nature seems to have amused herself with producing something imperfect and grotesque."

TARE, TRET, CLOFF, &c. These terms, though specially of commercial importance, are found in treatises of arithmetic, and must therefore be briefly noticed. 1. *Tare*, derived from the Italian *tarare*, to abate, is the allowance made for the box or bag in which goods are packed. 2. *Tret*, probably derived from the Italian *tritare*, to crumble, is an allowance of 4lbs. in 104lbs. for waste. 3. *Cloff*, or *clough*, defined to be that wherein any thing is put for carriage sake, is an allowance of 2lbs. in 3cwt., in order that the weight may hold good, when the article is sold by retail. 4. *Gross* weight, is that of the goods and the package taken together. 5. *Suttle*, probably derived from the Italian *sottile*, fine or valuable, denotes the weight which remains, when the tare only is allowed: it is the finer part, separated from the coarser. 6. *Net*, from the Italian *netto*, signifies the weight which remains when all allowances are made.

TARRAS or TERRAS. A volcanic earth, found in Germany and Sweden, and, when pulverised, used as a cement. It does not differ much from puzzolana, but it is much more compact, hard, porous, and spongy.

TARSI. The feet in insects, which are articulated, and formed of five or a less number of joints.

TARTAR. Bitartrate of potash; a salt deposited on the sides of casks during the fermentation of wine, owing to its insolubility in alcohol. This is *crude* tartar, and it is also called *argol;* when purified, it is called *cream of tartar.*

TARTARIC ACID. A bibasic acid, existing in many fruits, and also as tartrate of lime in several roots, but prepared only from the juice of the grape, which contains tartaric acid in the form of tartar or bitartrate of potash.

TARTARINE. The name given by Kirwan to the vegetable alkali, or potash.

TARTRATE. A neutral compound of the tartaric acid with a base.

TAURUS. The Bull; the name of the second zodiacal constellation, consisting of 141 stars, the principal of which is Aldebaran. It denotes the second month of autumn, extending from the 20th of October to the 20th of November, and the period of tillage in Egypt, when other countries have done sowing.

TAURUS PONIATOWSKI. A modern northern constellation, consisting of seven stars, formed by a Polish astronomer, the Abbé Poczobut, in the year 1778. It is situated between Aquila and Ophiuchus.

TAU'TOCHRONE (ταὐτὸ, the same, χρόνος, time). A term in Mechanics for a curve line having this property, that a heavy body descending along it by the action of gravity will always reach the lowest point in the same time, from whatever point in the curve the body begins to descend. This is, under certain circumstances, the property of the cycloid.

TAU'TOLITE. A crystalline mineral, said to consist of silicate of protoxide of iron and silicate of magnesia, and found in the volcanic rocks of the lake of Laach, near Bonn, on the Rhine.

TA'XICORNS (*taxus*, the yew, *cornu*, a horn). A family of coleopterous insects, in which the antennæ gradually increase in size as they extend from the head, or terminate in an enlargement.

TECTIBRANCHIA'TA (*tectus*, covered, *branchiæ*, gills). An order of aquatic *Gasteropods*, which have their branchiæ situated on the back or on the side, and concealed or covered by the mantle, as in the *aplysia* and the *pleurobranchus*.

TEGMEN. Literally, a covering; hence, applied by Mirbel to the internal integument of the seed, the *endopleura* of Decandolle; and, by Palisot de Beauvois, to the glume of grasses.

TEGME'NTA (*tegmentum*, a covering). In Botany, the scales of the bud. They are termed *foliaceous*, when they consist of abortive leaves; *petiolaceous*, when they are formed by the persistent base of the petiole; *stipulaceous*, when they arise from the union of stipules, which roll together and envelope the young shoot; and *fulcraceous*, when they are formed of petioles and stipules combined.

TEI'NOSCOPE. *Prism telescope.* An instrument formed by combining prisms in a particular manner, so as to correct the chromatic aberration of light, and to increase or diminish the linear dimensions of objects viewed through it.

TELEGRAPH (τῆλε, afar off, γράφω, to write). An apparatus for communicating intelligence to a great distance, by means of signals to which a conventional meaning is attached. A telegraph is also called a *semaphore* (σῆμα, a sign, φέρω, to bear); the latter term is, however, more comprehensive than the former, as it relates to the communication of intelligence, not merely by signals resembling *written characters*, but also by audible signals, by beacons, and other pyrotechnic contrivances. See *Tellograph.*

TELEGRAPH, ELECTRICAL. An apparatus for conveying thought by means of the electric current, the signals being given by the different actions of the current, which is carried from station to station along insulated conductors. The currents are excited either by hydro-electric batteries, or by magnetic induction, and rotatory machines; the telegraphic signals are either the deflections of magnetized needles, or the intermittent excitation of magnetism in electro-magnets, or the physiological phenomena.

TELE'NGISCOPE (τῆλε, afar off, ἐγγὺς, near, σκοπέω, to see). A new instrument, combining the powers of the telescope and of the microscope.

TELEOSAU'RUS (τέλεος, perfect, σαῦρος, a lizard). An extinct genus of Saurian reptiles, characterized by a combination of a bi-concave structure of the vertebræ with long narrow jaws. This genus, and that of the *steneosaurus*, have been associated together by Professor Owen, the characters of the two genera being mainly derived from the difference of position in the external nostril.

TE'LESCOPE (τῆλε, afar off, σκοπέω, to see). An optical instrument for discovering and viewing distant objects. *Astronomical telescopes* are of two kinds, refracting and reflecting; in the former, an image of the object viewed is formed by a lens, termed the object-glass, which *refracts* the rays from the object into one point; in the latter, the rays of light are *reflected* by a concave speculum or mirror, by which an image of the object viewed is produced. The point where the image is distinctly formed by the lens or mirror is the *focus;* and the distance of this point from either the one or the other is the *focal length* of the telescope.

1. *Reflecting telescopes* are of three kinds. 1. The *Gregorian* has a hole pierced in the centre of the large mirror to receive the eye-piece; the rays from the object falling on the large speculum are reflected to its focus; there they are received by a small concave mirror, whose focus coincides with that of the large one, and reflected through the aperture, where they are received, and the image magnified by the eye-glass. 2. The *Cassegrainian telescope* differs from the above only by the small mirror being made convex instead of concave. 3. The *Newtonian telescope* has no aperture in the large speculum, but the rays it reflects are received on a plane speculum near the object glass of the tube, which is fixed at an angle of 45° with the axis, and by it are reflected to the side of the tube, where the rays are brought to a focus by the eye-glass. The telescope of Lord Rosse is constructed on this principle.

2. *Terrestrial telescope.* The inversion of the object is of little consequence when the instrument is employed for astronomical purposes, for since the forms of the heavenly bodies are spherical, their positions, in this respect, do not affect their general appearance. But for *terrestrial* purposes, this is manifestly a great defect, and therefore those constructed for such purposes as ship or spy glasses, have two additional lenses, by

means of which, the images are made to appear in the same position as the objects. These are called *double telescopes.*

TELESCO′PIUM. The Telescope; a modern southern constellation, consisting of nine stars. It is surrounded by Ara, Pavo, Sagittarius, and Ophiuchus.

TELLI′NIDÆ. Solid and closed bivalves: a family of the macrotrachian mollusca, in which the two siphons of the animal are of enormous length.

TELLINI′NÆ. A sub-family of the *Tellinidæ*, named from the genus *tellina*, in which the siphons are excessively long.

TE′LLOGRAPH (τῆλε, afar off, λόγος, a word, γράφω, to write). This term, contracted from *telelograph*, is used by Edgeworth, who observes that while "*telegraph* is a proper name for a machine which describes at a distance, *telelograph*, or, contractedly, *tellograph*, is a proper name for a machine which describes *words* at a distance."

TELLU′RIUM (*tellus*, the earth). A rare metal of a brilliant silvery-white lustre, found in abundance at Schemnitz, in Hungary, combined with bismuth; and in the silver mine of Sadovinski in the Altai, united with silver and with lead. With oxygen, it yields the *tellurous* and the *telluric* acids.

Telluretted hydrogen. A gaseous compound of tellurium and hydrogen, analogous in constitution and properties to sulphuretted hydrogen.

TEMPERAMENT (*tempero*, to mix together, to temper). *Crasis.* A mixture or tempering of elements; a notion founded on an ancient doctrine of four qualities, supposed to *temper* each other: these are, in the abstract, hot, cold, dry, moist; in the concrete, fire, air, earth, water.

TEMPERAMENT, EVEN. A musical instrument is said to have an *even temperament*, when it has been so tuned that the differences between the intervals are perfectly equalized. To accomplish this, the difference must be so distributed among all the semitones of the octave, that, when sounded, they do not bear an exact ratio to any fundamental note whatever, but the deviation is so small as to be imperceptible.

TEMPERATE ZONES. The two divisions, or *belts*, of the surface of the earth, which lie between the Tropics and the Polar Circles—one in each hemisphere. They are named from their temperature being free from the excessive heat of the Torrid, and from the excessive cold of the Frigid Zones.

TE′MPERATURE (*tempero*, to mix various things in due proportions). The comparative degree of active heat accumulated in a body, as measured by an instrument, or by its effects on other bodies. By the term *mean annual temperature* is meant the temperature obtained by adding together the temperatures of all the months of the year, and dividing the sum by the number of the months; so that the mean annual temperature expresses that height at which the thermometer would stand at any place, if we could suppose it perfectly stationary throughout the whole year.

TEMPERING. The operation of heating iron to a certain extent, indicated by the colour presented on the surface of the metal.

TEMPORARY STARS. Stars which have appeared, from time to time, in different parts of the heavens, blazing forth with extraordinary lustre, and, after remaining awhile apparently immoveable, have disappeared and left no trace. Of this kind was the star which appeared, A.D. 389, near α Aquilæ, and, after remaining for three weeks as bright as Venus, disappeared entirely.

TENA′CITY (*tenax*, capable of holding). The degree of force with which the particles of bodies cohere, or are held together; a term particularly applied to metals which may be drawn into wire, as gold and silver.

TENDENCY. This word is employed in *two* senses. By a 'tendency' towards a certain result is sometimes meant, 'the existence of a cause which, if *operating unimpeded*, would produce that result.' In other cases, a 'tendency' towards a certain result is understood to mean 'the existence of such a state of things that that result *may be expected to take place.*' In the former sense, we say that the earth has a *tendency* to fly off at a tangent; but in the latter, the earth has a greater tendency to remain in its orbit than to fly off from it. In the former sense, it may be said that population has a *tendency* to increase beyond subsistence; in the latter, that subsistence has a tendency to increase at a greater ratio than population. *Whately.*

TENDRIL. *Cirrhus.* A particular form of the petiole in certain plants, as the vine; it appears to be a contrivance employed by nature to support plants by the aid of others, and was included by

Linnæus among the class of *fulcra*, or props.

TE'NNANTITE. Sulphuret of copper, occurring in Cornwall in copper veins which intersect granite and clay-slate, associated with common copper pyrites. It is a variety of grey copper ore, and was named in honour of Mr. Smithson Tennant.

TENOR (*teneo*, to hold). That compass of the voice which is between the highest and the lowest; neither raised to a treble, nor lowered to a base, but ranging from C, the second space in the base, to G, the second line in the treble. The term alludes to the air, in part-compositions, being *held* by the tenor. *Tenor-clef* is the C, or mean clef, placed on the fourth line for the use of the tenor voice.

TENSION or INTENSITY. Terms employed in electricity to denote the degree to which a body is excited, as estimated by the electrometer. It must be distinguished from *quantity*.

TENTA'CULA (*tentaculum*, from *tento*, to feel). Feelers; organs by which certain animals attach themselves to surrounding objects, &c.

TENTH. An interval in Music, consisting of nine degrees and five spaces.

TENTHREDI'NIDÆ. The Saw-flies; a family of the phytophagous *Terebrantia*, named from the genus *tenthredo*, and characterized by the saw-like character and operation of the ovipositor. By Latreille, the family is termed *Securifera*, or the hatchet-bearers.

TE'NUES (*tenuis*, thin). The correct distinction of the letters called *tenues*, as opposed to those which are called *medials*, is, perhaps, this, that in the pronunciation of the *tenues p*, *k*, *t*, the organs employed in articulation have only a small portion of their surfaces brought into contact, and that but for a short time; while in the articulation of *b*, *g*, *d*, the surface in contact is more extensive, and the effort less rapid.

TE'NUIRO'STRES (*tenuis*, slender, *rostrum*, a bill). A group of the *Insessores*, or Perching birds, characterized by a very slender and elongated, straight or curved, bill. They include the humming-birds, the sun-birds, the hoopoes, the honey-suckers, and the birds of paradise.

TERCINE. The botanical name for the epidermis of the nucleus of the ovule, when it separates in the form of a *third* coating or integument.

TEREBRA'NTIA (*terebro*, to bore). A section of *Hymenopterous* insects, which are furnished with an ovipositor, by means of which they are enabled to bore a hole in certain substances for the deposition of their eggs. See *Ovipositor*.

TE'REBRATING (*terebra*, a perforating instrument). A term applied to those testaceous animals which take up their abode in other substances, as the pholas.

TERGE'MINATE. This term is employed, in Botany, when each of two secondary petioles bears towards its summit one pair of leaflets, and the common petiole bears a third pair at the origin of the two secondary petioles, as in mimosa tergemina.

TERM, LOGICAL. A proposition consists of two terms; that which is spoken of is called the *subject;* that which is said of it, is the *predicate;* and these are called the *terms* (or extremes), because, logically, the subject is placed *first*, and the predicate *last*. In the middle is placed the copula, which indicates the act of judgment, as by it the predicate is affirmed or denied of the subject.

Every syllogism has three, and only three terms: viz. the middle term, and the two terms (or *extremes*, as they are commonly called) of the conclusion or question. Of these, 1st, the *subject* of the conclusion is called the *minor term;* 2nd, its *predicate*, the *major term;* and 3rd, the *middle term* (called by the older logicians "argumentum") is that with which each of them is separately compared, in order to judge of their agreement or disagreement with each other. *Whately.*

TERMS, ALGEBRAICAL. In Algebra, those parts of an expression, which are connected by the sign + or —, are called its *terms*, and the expression itself is said to be *simple* or *compound*, according as it contains one or more terms. Thus a^2 and $-b^3$ are each simple quantities, and $a^2 + ab - b^2$ is a compound quantity, whose terms are a^2, $+ab$, and $-b^3$.

When one quantity is said to be expressed *in terms* of another, the expression generally means merely that the former is to be an explicit *function* of the latter. Thus, in $x + y = a$, we have expressed $x + y$ in terms of a; deduce $y = a - x$, and we have y expressed in terms of a and x.

TE'RMINAL. "Term is a word of geometry very little used, and signifying boundary or extremity; the words 'terminal value' and 'terminal form' are sometimes used to signify the last and most complete value or form. When a finite expression, added to a certain number of terms of a series, makes up the equivalent of the expression from which the series is deduced, or stands for all the subsequent terms of the series, this finite expression might be called the *terminal* expression. Thus, in Taylor's Theorem, we have one terminal expression in D'Alembert's form, another in that of Lagrange." *Pen. Cycl.*

Terminal Language. "All the use of the terms 'infinitely small' and 'infinitely great' is entitled to this name: when we say that a circle *is* a regular polygon with an infinitely great number of infinitely small sides, the language used is that of an end arrived at, a transformation actually made; the circle is described as actually consisting of straight lines; and the language is *terminal*, expressive of a boundary actually attained. But the meaning of this language is, or is generally held to be, false; to obviate the difficulty, terminal language, properly employed, may be made the means of abbreviation of all those truths whose announcement contains interminable approximation." *Ibid.*

TERMINATE and INTERMINATE. A *terminate* number is an integer, a mixed mumber, or a vulgar fraction. As a mixed number may be reduced to a vulgar fraction, all terminate numbers may be expressed by $\frac{m}{n}$, where m and n are integers; and when the number is an integer, $n = 1$, and the number $= m$.

Interminate Number. A number which is not terminate, is called an interminate number. Interminate numbers comprehend interminate decimals, excepting repeaters and circulaters, which can be reduced to vulgar fractions, and are, therefore, terminate numbers, although, however, in the form of decimal fractions, they are called interminate decimals.

TERMINO'LOGY. In every treatise of science, the preliminary part, which is devoted to the explanation or definition of the terms employed, is called the *terminology* of that science.

TERMI'TIDÆ (*termes*, the white ant). A group of *Neuropterous* insects distinguished from the dragon-flies and the day-flies by their terrestrial habits.

TERMITI'NÆ. A section of neuropterous insects, named from the *termes*, or white ant, and comprising also the genera mantispa, raphidia, and psocus. By some naturalists these genera are considered as constituting distinct families.

TE'RNARY. A term applied by Dalton to any chemical substance composed of three atoms. By *ternary compounds* are now generally understood combinations of binary compounds with each other, as of sulphuric acid with soda in Glauber's salt, and the salts generally.

TERNATE, BITERNATE, &c. In Botanical nomenclature, these terms relate to the composition or arrangement of parts upon the stem. 1. *Ternate* denotes that three leaves or other organs are in opposition round a common axis. 2. *Biternate* signifies that three secondary petioles proceed from the common petiole, and that each bears three leaflets, as in fumitory. 3. *Triternate* implies that the common petiole is divided into three secondary petioles, each of which is subdivided into three tertiary petioles, each of the latter bearing three leaflets.

TERRESTRIAL MAGNETISM. A term denoting the action of the magnetic fluid in or about the earth; the effects of that action being manifested in the phenomena presented by magnetized needles or bars.

TERRI'COLA (*terra*, the earth, *colo*, to inhabit). An order of the Annellida, which includes the earth-worms.

TERTIARY STRATA. A series of sedimentary rocks, with characters which distinguish them from two other great series of strata—the secondary and the primary—which lie *beneath* them.

TERTIARY SYSTEM. A comprehensive geological term, representing all the regular deposits newer than the chalk. It admits of three primary divisions—*eocene*, *miocene*, and *pliocene*—names which imply that, in the lowest division, we only find the dawn of existing species; that, in the next division, there are more living species, but that extinct species still predominate; and that, in the uppermost division, extinct species decline, and living species predominate.

TE'SSELLATED (*tessella*, chequerwork). Divided into squares or chequers, either by a division of colours, or by the crossing of striæ.

TEST (*testis*, a witness). A re-agent; a substance which, when added to another substance, *tests* or distinguishes its chemical nature or composition. *Test* *paper* consists of letter-paper dipped several times into a filtered solution of litmus, and dried after each immersion, until it is of a deep purple colour.

TESTA. Literally, a shell; and, hence, applied by botanists to the integuments of the seed. By Mirbel, these integuments are called *lorica*, by Richard *perisperm* and *episperm*, and by De Candolle *spermoderm.* It appears to consist of two coats, and, in succulent seeds, of an intervening substance called *sarcoderm.*

TESTA'CEA (*testa*, a shell). Molluscous animals, having a shelly covering, as the oyster.

TESTUDI'NIDÆ (*testudo*, a tortoise). Land-tortoises; a family of Chelonian reptiles, distinguished by their highly arched carapace, and short clubby feet.

TETRABRANCHIA'TA (τετρὰς, four, *βράγχια*, gills). An order of *Cephalopods*, represented in modern times by the *Pearly Nautilus*, in which there are four branchial organs, two on each side. See *Dibranchiata.*

TE'TRACHORD (τετρὰς, four, χόρδη, a chord). The Greek name for any part of the scale of music consisting of four notes, the highest of which is a perfect fourth to the lowest.

TETRADYNA'MIA (τετρὰς, four, δύναμις, power). The fifteenth class of Linnæus's system of plants, characterized by the presence of six stamens, of which four are long, two short, as in Stock.

TE'TRAGON (τετρὰς, four, γωνία, an angle). A figure with four angles, usually applied only to the square.

TETRAHE'DRON (τετρὰς, four, ἕδρα, a seat). A geometrical solid contained by four equal and equilateral triangles.

TETRA'MERA (τετρὰς, four, μέρος, a part). A section of *Coleopterous* insects, in which all the tarsi have four distinct joints, the fifth being very minute, and concealed in the others. *Latreille.*

TETRA'NDRIA (τετρὰς, four, ἀνὴρ, male). The fourth class of plants in Linnæus's system, characterized by the presence of four stamens of equal length. See *Didynamia.*

TETRAO'NIDÆ (*tetrao*, the grouse). The Grouse family of the Rasores, or Scratching Birds, characterized by their very short hind toe and very short tail. They differ as little from the partridges as these from the pheasants. They vary much in size.

TEU'THIDÆ (*teuthis*, a calamary). A family of Cephalopods, of which the loligo vulgaris, or *teuthis*, is the type.

TEXTURE OF ROCKS. By *texture* is meant the mode of aggregation of the mineral substances of which rocks are composed, and it relates to the arrangement of their parts viewed on a smaller scale than that of their *structure.* In this respect rocks may be *simple* or *compound*, that is, composed of a single mineral species, or of several species. Compound rocks are said to be *fragmentary*, when their particles or fragments are united by a cement; *aggregated*, when their particles cohere without the intervention of a cement.

1. The *texture of simple rocks* is said to be, 1, *compact*, when the particles or crystals are so minute as not to be distinguished by the naked eye, as in some kinds of felspar and limestone; 2, *earthy*, when the particles are minute, and having little cohesion, readily crumble, as in some kinds of chalk; 3, *granular*, when the particles or crystals are distinguishable, and of a rounded form, as in oolite; 4, *crystalline*, when the particles are readily distinguishable, confusedly aggregated, and present the appearance of imperfect crystals, as in primary limestone; 5, *scaly*, when the particles are disposed in the form of small scales, as in some varieties of clay-slate; 6, *lamellar*, when the rock is composed of very thin lamellæ, or plates, as in some kinds of pitchstone; 7, *laminar*, when composed of thin parallel laminæ, or plates, as in clay-slate; 8, *fibrous*, when composed of very elongated slender crystals, as in fibrous gypsum; and, 9, *radiated*, when the fibres present a radiated or divergent arrangement, as in actinolite slate.

2. The *texture of aggregated compound rocks* is said to be, 1, *compact*, when the particles are so minute, as to give the rock a dense, homogeneous appearance, as in some kinds of granite and greenstone; 2, *earthy*, as in lava; 3, *granular*, as in clay and marl; 4, *crystalline*, also called granular or granitic by geologists, as in granite and hornblende rock; 5, *slaty*, as in gneiss, mica-slate, and chlorite-slate; this texture being crystalline in the compound rocks, but with the component minerals more extended in one direction than in another, and thus arranged so as to form distinct laminæ; 6, *porphyritic*, when in a basis, either crystalline or compact, distinct crystals are interspersed, as in various kinds of porphyry, porphyritic granite, syenite, and

green-stone; 7, *amygdaloid*, when in a basis, generally compact, sometimes crystalline or earthy, are interspersed roundish or oval bodies, composed of one or more mineral substances, as in amygdaloidal clay-stone or green-stone; and 8, *cavernous*, presenting numerous small cavities, roundish, oval, or of various forms, in a compact or granular rock.

3. The *texture of fragmentary rocks* is said to be, 1, *brecciated*, when it consists of angular fragments, cemented together, constituting breccia; and, 2, *conglomerated*, when it consists of rounded fragments of quartz, granite, flint, or other substances cemented together, forming conglomerate.

THALAMIFLO'RÆ (*thalamus*, a bed, *flos*, a flower). A sub-class of Exogenous plants, having a calyx and corolla, petals distinct, and stamens hypogynous. Every part of the flower springs separately from the thalamus, without contracting cohesion with each other, as in Ranunculaceæ.

THA'LAMUS. Literally, a bed; and, hence, the term is applied by botanists to the dilated summit of the peduncle upon which the carpels are seated; the term is synonymous with *torus* and with *receptacle*. In the nomenclature of fungaceous plants, it is the same as *thallus*, or the bed of fibres from which many fungi arise.

THALASSI'NIANS. A family of those macrurous decapods which have the four anterior feet terminated by two fingers, and are remarkable for the extreme elongation of the abdomen and the small degree of consistence of their integuments. They are named from the genus *thalassina* of Latreille.

THALA'SSIOPHYTES (θαλάσσιος, belonging to the sea, φυτὸν, a plant). Sea-plants; a general term applied to the vegetable productions of the ocean, of its rocks and its shores. It is synonymous with the term *hydrophytes*, and comprises all the plants usually designated as marine algæ, viz. fucus, ulva, &c.

THALLUS. A term applied to the lobed frond of lichens, and to the bed of fibres from which many *fungi* arise; it is generally employed to denote the combination of stem and leaves in the lower cryptogamic plants. *Thallodes* is the adjective used to designate any thing arising from the thallus.

THAU'MATROPE (θαῦμα, a wonder, τρέπω, to turn). A philosophical toy, in which two objects painted on opposite sides of a card,—as a man and a horse, a bird and a cage,—are, by a quick rotatory motion, made to impress the eye in combination, so as to form one picture, of the man on the horse's back, the bird in the cage, &c. A mental illusion closely analogous to this, is produced, when by a rapid and repeated transition from one subject to another alternately, —by a kind of intellectual thaumatrope—the mind is deluded into an idea of the actual combination of things which are really incompatible. *Whately.*

THE'CA (θήκη a capsule). A term applied, in Botany, to the cavity of the anther, to the sporangium of ferns, to the urn of mosses, &c.

THECADA'CTYLES (θήκη, a theca or hollow case, δάκτυλος, a toe). The name given by Cuvier to those Geckos which have the toes enlarged throughout their length, and furnished below with transverse scales, which are divided by a longitudinal furrow, in which the claw may be entirely concealed.

THE'CAPHORE (θήκη, a capsule, φέρω, to bear). The stalk upon which the ovary of plants is sometimes seated, as in tacsonia. The term is synonymous with *gynophore*, *podogynium*, &c.

THE'CODONTS (θήκη, a theca or socket, ὀδοὺς, a tooth). This and some other similar terms have been employed to denote the leading modifications in the mode of attachment of the teeth among the inferior or squamate saurians. The base of the teeth may be either ankylosed to the summit of the alveolar ridge, or to the bottom of an alveolar groove, and supported by its lateral wall. These modifications are indicated respectively by the terms *acrodont* and *pleurodont*. By a third mode of fixation, the teeth are implanted in sockets, either loosely or confluent with the bony walls of the cavity: these, Professor Owen calls *thecodont lacertians*.

THECO-SO'MATA (θήκη, a theca or cavity, σῶμα, a body). The name given by De Blainville to the first family of *Aporobranchiata*, or those molluscs which are provided with natatory appendages, without any foot properly so called, and with the organs of respiration but little evident. According to Mr. J. E. Gray, the thecosomata constitute the first order of the class *Pteropoda*.

THE'COSTOMES (θήκη, a cavity, στόμα, the mouth). The name given by Latreille to those insects which have a suctorious mouth enveloped in a sheath.

THELPHU'SIANS. The name given by Milne Edwards to a tribe of brachyurous crustaceans belonging to his family *Catometopes*, and constituting a connecting link between the Cancerians and the Gecarcinians, or land-crabs. They are named from the genus *thelphusa*, supposed to be the Heracleotic crabs of Aristotle.

THE'NARDITE. Anhydrous sulphate of soda, found in crystalline crusts, at the bottom of the briny waters at the Salines d'Espartines, near Madrid. It is used in the preparation of carbonate of soda.

THEO'DOLITE. An instrument for measuring horizontal angles contained between lines supposed to be drawn from any point to two distant objects. In its simplest form, the theodolite consists of a divided circle, which is to be set parallel with the horizon; and a telescope which has so much motion in a vertical plane as to enable the observer to view any object which he may require above or below the horizon. The etymology of the term is obscure.

THE'OREM (θεώρημα, that which is looked at). In Mathematics, a *theorem* is a proposition in which the truth of some principle is asserted; the object of the demonstration being to show how the truth of the proposed principle may be deduced from the axioms and definitions, or from other truths which have been previously and independently established. The *theorem* asks for demonstration only, and thus differs from the *problem*, which asks for discovery both of method and of demonstration. See *Problem.*

THE'ORY (θεωρία, speculation). A system of rules, intended to explain certain facts, with reference to some real or hypothetical law. Thus, the theory of the planetary motions is deduced from the principle of gravitation; that of light, from the undulatory hypothesis. A *hypothesis* differs from a theory, as being an assumption conceived to afford a *support* to the real or supposed law: thus, to refer the phenomena of gravitation to the universal diffusion of ether, is a hypothesis. The *theory* is, however, unaffected by the *hypothesis*.

THEORY OF COUPLES. The term *couple* was applied by M. Poinsot to a pair of equal and opposite forces, not equilibrating each other, and not capable of being replaced by a single force, or resultant,—in fact, an *incomposible* couple. The *plane* of the couple is the plane drawn through the parallel forces the *arm* of the couple is any line drawn perpendicular to the forces from the direction of one to that of the other, the *axis* of the couple is any straight line perpendicular to its plane. If we consider any axis, it will be evident that the moment or leverage of the couple to turn the system about that axis is represented by the product of one of the forces and the arm. For if, with reference to the axis, x be the arm of one of the forces, $x \pm a$ is that of the other, a being the arm of the couple. Hence, if P be one of the forces, the united leverage is $P(x \pm a) - Px$ or $\pm Pa$. This product Pa is called the *moment* of the couple. *Pen. Cycl.*

THEORY OF EQUATIONS. The Theory of Algebraical equations is that branch of analysis, which relates to the discussion of equations when presented in their most convenient form for solution; and its great object is to develope the properties and to evolve the values of the real and the imaginary roots. See *Equation, Algebraic.*

THERMAL RAYS (θέρμη, heat). Luminous thermal rays are those rays of heat which are combined with flame, as those emitted from the sun, which penetrate all diathermanous substances. Those rays, on the contrary, are said to be *opaque*, which proceed from bodies heated below the point of active combustion. Hence, bodies are either *perfectly* or *partially* diathermanous, the former transmitting all the thermal colours, the latter only some of them.

THERMAL SPECTRUM. When Thermal rays have been transmitted through a diathermanous prism, they compose a *thermal spectrum*, in like manner as the sun's rays form a solar spectrum. See *Spectrum.*

THERMO-ELECTRICITY (θέρμη, heat). A term applied to the phenomena which are exhibited by electricity as developed by heat. The condition of the electrical equilibrium of bodies is disturbed by heat, especially when the temperature of a part of their mass is either raised or lowered; the effects being exhibited by the deflexions of a magnetized and balanced needle.

THERMO-MULTIPLIER (θέρμη, heat). A thermo-electric pile, employed by Melloni for detecting changes of temperature, and endowed with much greater sensibility to the impressions of heat than the most delicate mercurial, or air thermometer.

THERMOMETER (θέρμη, heat, μέτρον, a measure). Literally, a *measurer of heat;* an instrument for comparing the degree of active heat existing in other bodies, by its effect in expanding a column of mercury.

1. *Fahrenheit's Thermometer.* That arrangement of the scale of the instrument, in which the space between the freezing and the boiling points of water, under a medium pressure of the atmosphere, is divided into 180 parts, or degrees, the freezing being marked 32°, and the boiling 212°. This scale was adopted by Fahrenheit, because he supposed, erroneously, that 32 of those divisions below the freezing point of water (which was therefore 0 on his scale) was the *zero*, or greatest degree of cold.

2. *Centigrade Thermometer.* This is the thermometer of Celsius, which is used in France, and is the most convenient in practice: it consists in that arrangement of the scale, in which the freezing point is marked 0, or *zero;* and the boiling point 100.

3. *Reaumur's Thermometer.* In this scale the freezing point is marked 0, or *zero*, and the boiling point 80°. The degrees are continued of the same size, below and above these points, those below being reckoned negative.

4. These different modes of graduation are easily convertible: the Centigrade scale is reduced to that of Fahrenheit by multiplying by nine and dividing by five; that of Reaumur to that of Fahrenheit by dividing by four instead of five: or that of Fahrenheit to either of these, by reversing the process. Thus—

C. 100°×9=900÷5=180+32°=212° F.
R. 80°×9=720÷4=180+32°=212° F.

Or, by reversing the order—

F. 212°−32=180×5=900÷9=100° C.
F. 212°−32=180×4=720÷9= 80° R.

5. A Table is added, showing the correspondence of the three thermometers.

Fahrenheit.	Centigrade.	Reaumur.
212	100·	80·
200	93·33	74·66
190	87·77	70·22
180	82·22	65·77
170	76·66	61·33
160	71·11	56·88
150	65·55	52·33
140	60·	48·
130	55·55	43·55
120	48·88	39·11
110	43·33	34·66
100	37·77	30·22
90	32·22	25·77
80	26·66	21·33
70	21·11	16·88
60	15·55	12·44
50	10·	8·
40	4·44	3·55
32	0·	0·
20	−6·66	−5·33
10	−12·22	−9·77
0	−17·77	−14·22

6. *Thermometer, Differential.* This instrument consists of two glass bulbs, connected by a glass tube bent in the form of the letter U. The tube is partly filled with a coloured liquid. On exposing one bulb to heat, the expansion of the air forces the liquid down, and causes it to rise in the opposite part of the tube. This instrument is not intended to indicate the temperature of the atmosphere, as the application of cold or heat to both bulbs at the same time produces no alteration in the level of the liquid; it merely indicates the *difference* of temperature between the two bulbs.

7. *Thermometer, Register.* An instrument by which the highest and lowest temperatures which occur within a given time, are indicated and made to register themselves. It consists of two thermometers placed with their tubes in a horizontal position. The one contains spirit of wine, the other contains mercury. In the stem of the former a small iron wire, placed at the surface of the mercury, acts the part of an index, being propelled forward as the mercury expands, and being left at the point of greatest expansion, when the mercury contracts; it then indicates the highest temperature which has occurred during an observation. In the stem of the latter a small piece of ivory is immersed in the spirit, and by a slight inclination of the instrument is brought to the surface of the liquid. When the temperature falls, the ivory is carried back with the spirit; but, when the temperature rises, the spirit only advances, the ivory being left behind, thus indicating the lowest temperature which has occurred. By inverting the thermometer, the ivory is brought again to the surface for a new observation.

8. *Thermometer, Magnetic.* An apparatus for employing the thermo-electric current as a measurer of temperature in cases in which other instruments are not sufficiently delicate; or in cases in which

the temperatures are so very high or so very low that our ordinary pyrometers and thermometers cannot be relied on; or, lastly, in places in which other kinds of apparatus could not be used. The strength of the current generated by the heat in a thermo-battery measures its temperature; the intensity of the current being estimated, as in hydro-electric batteries, by the deflection of a magnetic needle.

THE'RMOPHONE (*θέρμη*. heat, *φώνη*, sound). An apparatus, also called, from its discoverer, *Trevelyan's instrument*, for producing sounds from heated metals when placed under certain circumstances. It consists of a metallic body, generally of brass, which is first heated and then laid on a cold block of lead, to which it gradually imparts its heat; during the process of cooling, the former body contracts in a manner by regular pulsations, and in so doing emits musical sounds, which cease entirely when the temperatures of the two metals are equalized.

THERMOSCOPE (*θέρμη*, heat, *σκοπέω*, to observe). The name of a particular kind of thermometer, which *shows* or *exhibits* the changes of heat to the eye. So, *pyroscope* is the name of a particular kind of pyrometer.

THERMOSTAT (*θέρμη*, heat, *ἵστημι*, to fix). *Heat-governor.* A self-acting apparatus for regulating temperature, constructed on the principle of the unequal expansion of metals by heat.

THIN OUT. A term employed when a geological stratum, in the course of its prolongation in any direction, becomes gradually less in thickness; the two surfaces approach nearer and nearer, and when, at last, they meet, the stratum is said to *thin out* or disappear.

THIRD. An interval in music, classed among the imperfect concords, from its variable nature, as it may be either major or minor. The ratio of the *major* third is 5 : 4; that of the *minor*, 6 : 5. The former comprises one major and one minor tone, as C E; the latter, a major tone and a semitone, as A C.

THO'MPSONITE. A mineral of the zeolite family, found near Kilpatrick.

THORITE. A mineral found in syenite, in Norway, containing about 58 per cent of thorina.

THO'RIUM. A metal obtained from a black mineral, called *thorite*, from the coast of the North Sea, and named from the Scandinavian deity Thor. *Thorina* is considered to be a protoxide.

THOROUGH-BASE. A technical term expressive of the art of playing an accompaniment on keyed instruments from figures representing chords, and placed over or under the notes of the instrumental base staff.

THREE, RULE OF. The name given to an arithmetical rule which teaches, from three given quantities, to find a fourth, bearing a certain relation to them. The relation is, that the first quantity shall bear the same proportion to the second as the third to the fourth, or the required quantity. The rule may therefore be briefly stated to be that by which a fourth proportional is found to three given quantities.

Double Rule of Three. Questions may arise in which, instead of 3 terms given to find a fourth, we may have 5 given to find a sixth. The rule in such cases might be called the *Rule of Five.* "Write the given quantities in two lines, keeping quantities of the same sort under one another, and those which are connected with each other in the same line. Draw a curve through the middle of each line and the extremities of the other. There will be three quantities on one curve and two on the other. Divide the product of the three by the product of the two, and the quotient is the answer to the question." *De Morgan.*

THULITE. A mineral, usually granular, found in Norway, and consisting principally of silica, alumina, and lime.

THU'MERSTONE. A mineral found in beds at Thum in Saxony. It is also called *axinite*, from the axe-like form and edge of its crystals.

THUNDER. This phenomenon is supposed to be occasioned by the sudden rushing of the air into a partial vacuum produced by the heat of lightning. For its prolongation, various causes have been assigned.

THYRSUS. A form of inflorescence, consisting of a compact panicle, the middle branches of which are longer than those of the apex or of the base, as in lilac. The thyrsus has been also defined as an inflorescence at first centripetal, afterwards centrifugal.

THYSANO'URA (*θύσσω*, obsolete; from *θύω*, to move rapidly, *οὐρὰ*, a tail). The Spring-tails; an order of insects which jump by means of their tail. They are wingless, and do not undergo metamorphosis.

TIDES. A term applied to the periodic rising and falling of the ocean, caused chiefly by the attraction of the moon, but partly by that of the sun. The sea *flows*, or rises, as often as the moon passes the meridian, both the arc above, and the arc below the horizon; and it *ebbs*, or falls, as often as she passes the horizon, both east and west. When the moon is in the first and third quarter, i. e., when she is new and when she is full, or, in other words, when she is in *conjunction* or in *opposition*, the tides are high and swift, and are called *spring-tides;* when she is in the second, and last quarter, i. e., when she is a half-moon, or in her *quadratures*, the tides are lower and slower, and are called *neap-tides*.

TILE ORE. A sub-species of octohedral red copper ore. An *earthy* variety occurs massive and incrusting copper pyrites; the *indurated* variety is an intimate combination of red copper ore and brown iron ochre.

TILGATE BEDS. The name given by Dr. Mantell to a portion of the great series of strata in the Weald of Kent and Sussex, interposed between the greensands and the Portland oolite.

TIME. A certain measure of duration, depending upon the motion of the heavenly bodies.

1. *Equal* or *mean* time, is that which is reckoned by a clock, supposed to indicate exactly 24 hours, from 12 o'clock on one day, to 12 o'clock on the next day.
2. *Apparent* time, is that which is measured by the apparent motion of the sun in the heavens, as indicated by a meridian line, or sun-dial.
3. *Sidereal time* is that portion of a sidereal day which has elapsed since the transit of the first point of Aries, and represents at any moment the right ascension of any object which is then on the meridian.
4. *Astronomical time* of day is the time past *mean noon* of the day, and is reckoned on to twenty-four hours in mean time.
5. *Civil time* is mean time adapted to the purposes of civil life. The civil day commences at midnight, and is divided into twelve hours marked A.M. or *ante meridian*, and twelve marked P.M. or *post meridian*.

TIN. *Stannum.* A white metal obtained from the peroxide, or common ore, called *stream-tin.* The purer portion of the metal thus obtained, is called *grain tin*, the other portion ordinary tin or *block tin*. The metal is found associated with sulphur and copper, constituting *tin pyrites;* when combined with oxide of iron and silex, it is called *tin-stone* and *wood-tin*. The protoxide and the peroxide are named, respectively, the *stannous* and the *stannic oxide*.

TIN-FOIL. An alloy composed chiefly of tin, with a small portion of lead, and sold in the form of a leaf of about the 1-1000th part of an inch in thickness.

TINCAL. Crude borax, as it is imported from the East Indies, in yellow greasy crystals. When purified, it constitutes the *refined borax* of commerce.

TI'NEIDÆ (*tinea*, a moth). A family of *Lepidopterous* insects, consisting of small moths, which infest woollen stuffs and furs, upon which their larvæ feed.

TIPU'LIDÆ. A family of dipterous insects, belonging to the section Nemocera, and typified by the species commonly called *Harry-long-legs*.

TISSUE. A web, or web-like structure, constituting the elementary structures of animals and of plants.

TITAN-SHORL. *Rutile.* Native oxide of titanium, a mineral comprising the reticulated variety with golden varnish, from Moutier, near the Montblanc; acicular and capillary crystals of rutile in rock crystal, from Brazil, &c.

TITANI'FEROUS CERITE. A blackish-brown mineral, found on the Coromandel coast, and consisting of the oxides of cerium, iron, manganese, and titanium.

TITANITE. *Sphene.* Silico-titanite of lime, comprising the varieties of brown and yellow menakan-ore, in large crystals; and that from St. Gothard denominated *rayonnante en gouttiere* by Saussure, on felspar with chlorite, &c.

TITA'NIUM (*τίτανος*, calx). A metal which, in the form of *titanic acid*, constitutes several minerals, as menachanite, &c.

TOADSTONE. A provincial term applied to certain igneous or basaltic rocks associated with the limestone formation of Derbyshire.

TO'DIDÆ. The Todies; a family of the Insessores, or Perching birds, indigenous in America, where they may be regarded as representing the king-fishers of the Old Continent. See *Fissirostres*.

TOISE. *Orgya.* A French measure of length, consisting of six feet, or the ordinary height of man. It is employed in all the older French measures of the earth.

TOMBAC. A white alloy of copper with arsenic, called *white copper*.

TOME'NTUM. A term applied, in Botany, to the hairs of plants, when they are entangled, and closely pressed to the stem.

TOOTHED WHEELS. Wheels which are made to act upon, or, as it is called, to *drive* one another by having the surface of each indented with teeth, and fixing the centres at such a distance from each other that the teeth come successively into contact. The proper form for the tooth of such wheels is a question of much complexity.

TOOTHINGS OF LEAVES. The projecting parts of the margin of leaves, when the adhesion of the lobes is complete, and the parenchyma which separates the extremity only of the veins is not extended to the extremity of the principal veins, or beyond them. Such leaves are said to be *toothed* or *dentale;* and, when the teeth or toothings are rounded, they become *crenels*, and the leaf is said to be crenelled or crenate.

TOPAZ (τοπάζιον). A mineral species occurring massive in imbedded and rounded crystals. It forms an essential constituent of a particular mountain-rock, which is an aggregate of topaz, quartz, and schorl, and is called *topaz-rock*. It comprises three sub-species, common topaz, schorlite, and physalite.

TOPA'ZOLITE. A variety of precious garnet, found at Mussa, in Piedmont.

TOPO'GRAPHY (τόπος, a place, γράφω, to describe). The description of a place, as of a city, a town, a village; a term differing from geography, as a part differs from the whole.

TORNA'DO (*tornar*, Span. to turn). A sudden and violent storm of wind, accompanied by thunder, lightning, and rain, frequently occurring in the West Indies, and other parts. The term also denotes, generally, a typhoon or hurricane.

TO'RRELITE. A red mineral from New Jersey, named from Dr. Torrey, and consisting principally of silica, iron, and lime.

TORRICELLIAN EXPERIMENT. The name given to the experiment by which Torricelli, a pupil of Galileo, discovered that the mercury remains in the barometer tube at a height of nearly 30 inches above the level of the mercury in the cistern. The tube was hence called a Torricellian tube, and the vacuum in the tube above the surface of the mercury is the *Torricellian vacuum*, by which name it is distinguished from that obtained by the air-pump, sometimes called the *Guerickian* or *Boylean vacuum*.

TORRID ZONE (*torridus*, burning). That division, or *belt*, of the surface of the earth, which lies on each side of the equator, extending to the two tropics of Cancer and Capricorn, and so called from its excessive heat. See *Ascii*.

TORSION BALANCE. An instrument, invented by Coulomb, for the measurement of small attractive and repulsive forces, by the *torsion* or twisting of a fine metallic wire. The *electrical torsion balance* is made of a thin thread of shellac, carrying at its extremity a small gilded pith ball; this instrument forms a very delicate electrometer, and is also employed for estimating exactly the intensity of magnetic forces.

TORUS. A rope or cord made of twisted grass or straw, on which the ancients laid their skins or other furniture for the convenience of sleeping; hence the term is taken for a *bed*, and is used in botany as synonymous with *thalamus* or receptacle.

TO'TIPALMES (*tota palma*, an entire palm). The name given by Cuvier to a group of birds whose hind toe is united to the others by a continuous membrane; they comprise the pelican, the cormorant, the boobies, the frigate-birds, &c.

TOUCAN. A modern southern constellation, consisting of nine stars.

TOUCHSTONE. A variety of flinty-slate, frequently called Lydian stone.

TOURMALINE. *Schorl.* A mineral which is hard enough to scratch glass, and becomes electric by heat. It is of various colours and forms; the blue variety being called *indicolite*, and the red *rubellite;* it is transparent when viewed across the thickness of a crystal, but perfectly opaque when turned in the opposite direction. The ancients called it *lyncurium*. It occurs in gneiss, mica-slate, talc-slate, &c.

TRACHEA'TA (τραχεῖα, the trachea). An order of the Arachnida, comprising those species which breathe by means of tracheæ. See *Pulmonata*.

TRACHE'LIDES (τράχηλος, the neck). A family of the heteromerous Coleoptera, in which the head is separated from the thorax by a kind of neck. They are often of brilliant colours, as the blistering-fly.

TRACHE'LIPODS (τράχηλος, the neck, ποὺς, ποδὸς, the foot). A designation of those mollusca which have the locomotive disc or foot attached to the head. Under this title, which represents the third order of Lamarck, all the univalved shells are arranged.

TRACHE'NCHYMA (τραχεῖα, the trachea, ἔγχυμα, any thing poured in). A designation of the vascular tissue of plants, consisting of spiral vessels, which resemble the *tracheæ* of insects.

TRA'CHYLITE. The name of a mineral substance resembling obsidian.

TRA'CHYTE (τραχὺς, rough). A variety of lava essentially composed of glassy felspar, and frequently having detached crystals of felspar in the base or body of the stone, giving it the structure of porphyry. It sometimes contains hornblende and augite; and when these predominate, the trachyte passes into the varieties of trap called greenstone, basalt, dolorite, &c. The term is derived from the peculiar *rough* feel of the rock.

TRACTION (*tractio*, drawing). In Mechanics, the act of drawing a body along a plane, by the power of animals or of steam. The *angle of traction* is the angle which the direction of the power makes with a given plane. The power excited to produce the effect is called the *force of traction.* See *Horse-power.*

TRA'CTRIX or **TRACTORY.** A curve described by a heavy point attached to a string, the other end of which is moved along a given straight line or curve. It is characterized by this property, that the tangent is always equal to a given line.

TRADE WINDS. In a belt extending about 30° on each side of the equator, the wind is observed to blow all the year round from nearly the same quarter of the heavens: to the north of the equator it blows nearly from the N.E. quarter, and to the south of the equator from the S.E. quarter. These winds, from the great assistance which they afford to commerce, are called the N.E. and the S.E. *trade winds.* When ships are bound from Europe to the West Indies, or to any part of North America, south of the parallel of about 38°, they seek the aid of these winds; but when they return, they keep away to the northward for the purpose of avoiding them.

TRAJE'CTORY. A technical name formerly given to a curve required to be found by means of certain conditions; generally used for the required path of a projectile acted on by given forces.

TRAMMELS. Elliptic compasses, used for making figures of an elliptic form. In this instrument, a bar carrying a pencil is guided by two pins which move in grooves.

TRANSCENDE'NTAL (*transcendo*, to go beyond a certain limit). In the philosophy of Kant, the *transcendental* elements of knowledge are those which are original or primary, or those which are determined *à priori* in reference not only to human cognition, but also to man's collective activity; and which, consequently, are the basis of *empirical* knowledge, or that which is determined *à posteriori.* In short, all pure knowledge makes up the transcendental philosophy, and on it rest the authority and possibility of cognition. The term is thus synonymous with *metaphysical.*

A *transcendental problem*, according to the earliest meaning of the term, is one the equation of which is infinitely high, or contains an infinite series of powers of an unknown quantity, so that its highest degree transcends every degree. But the term transcendental has undergone many changes of meaning. The writers in the Penny Cyclopædia predict that it will settle into the following: "a transcendental result will be one which is incapable of expression, except by a definite integral, or by an infinite series which cannot be otherwise expressed than by a definite integral."

TRANSFORMA'TION. A term in Mathematics denoting a change made in the object of a problem or in the shape of a formula, in order to facilitate the solution, calculation, or use of the original problem or formula; as when an equation is transformed into another equation, having roots which bear simply a relation to the roots of the former. All the operation of Algebra consists in transformation, from and after the point at which the problem to be solved is reduced to an equation.

TRANSIT (*transeo*, to pass over). In Astronomy, this term denotes the passage of one heavenly body over the disc of a larger one, as that of Mercury, when he transverses the sun's disc under the form of a black spot. When the nearer body has the greater apparent diameter, so as to hide the other, the passage is termed an *occultation* of the latter.

TRANSIT INSTRUMENT. *Instrument des Passages,* An instrument by means of which the culminations of celestial objects are observed. It consists of a telescope firmly fastened on a horizontal axis directed to the east and west points of the horizon, or at right angles to the plane of the meridian of the place of observation.

TRANSITION SERIES. *Submedial rocks.* A geological designation of the upper metamorphic rocks, which form a kind of link between the primary and the secondary rocks, partaking of the characters of both. They are divided into two series or systems, the Greywacké and the Silurian.

TRANSLA'TION. This word is used in Mechanics, as distinguished from Rotation, in the following manner:—A body has motion of translation when all its points move in parallel straight lines; when, in fact, all its points have the same motion. If all have not the same motion, there is either simple rotation, that is, about one permanent axis; or rotation about a varying axis; or else a compound of translation and rotation. The motion of a single point must always be called translation, rotation being an inadmissible idea.—*Pen. Cycl.*

In Geometry, the word *translation* has a wider sense; perhaps, *transference* might be a preferable term, as applied to the motion of a figure from one part of space to another. The case meets us at the fourth proposition of the First Book of Euclid's Elements, in which we have to conceive of one figure being transferred by some means; for it is impossible to imagine *space removed*, or any part of *space* made to change place.—*Ibid.*

TRANSLU'CENT and TRANSPA'RENT. 1. *Translucent* bodies are those which permit light to pass through them, but not in sufficient quantity to render objects distinct, as to colour, distance, or form, when viewed through them. 2. *Transparent* bodies are those which permit the rays of light to pass freely through them, as air and some of the gases, which transmit light without being visible themselves: glass and water are less transparent. Translucent bodies might be termed *semi-transparent.*

TRANSMUTA'TION. The alchemical operation of changing the imperfect into the perfect metals. In geometry, the changing of one figure into another of equal area or content, as of a triangle into a square, of a sphere into a cube.

TRANSPOSITION. In Algebra, the process of removing or transposing a term from one side of an equation to the other, at the same time changing its sign. Thus, the equation, $a = b + c$ becomes, by transposition of c, the equation $a-c=b$, the value of which is precisely the same as that of the preceding. The process amounts to merely subtracting c from both sides of the equation.

TRANSVE'RSAL. The name given in Mathematics to a line, whether right or curved, which is drawn across or intersects a system of other lines, right or curved

TRANSVERSE. The name frequently given to one of the axes of a figure, usually that of the greater magnitude or which goes across the figure. Thus, the longer axis of an ellipse or of a hyperbola is the transverse axis; the equatorial axis of the globe is the transverse. Properly speaking, the term is merely relative: each axis is transverse to the other.

TRANSVERSE MAGNET. A peculiar variety of bar magnets, whose poles are not at the ends, but at the sides: these magnets have always some even number of *polar lines.* They are made by thrusting 2, 4, 6, &c. bar magnets through a ring in the direction of its diameter, and with their unlike poles opposite to each other; a sufficient space is left between these magnets to pass the bar between them which it is proposed to magnetise, so that it may touch them as it is drawn through.

TRAP and TRAPPEAN ROCKS (*trappa*, Swedish, a stair). Volcanic rocks composed of felspar, augite, and hornblende. The various proportions and state of aggregation of these simple minerals, and differences in external forms, give rise to varieties, which have received distinct appellations, as Basalt, Amygdaloid, Dolorite, Greenstone, and others. The term is meant to denote that the rocks of this class sometimes occur in large tabular masses, which rise one above another, like steps or *stairs.*

Trap conglomerate. The name given to conglomerates formed of fragments of greenstone, basalt, or claystone, together with portions of stratified rocks, more or less rounded by attrition, and imbedded in a paste of the same nature, or having their intervals filled up by it. Such deposits, usually in the form of irregular beds, are named by many geologists *trap tufa.* A considerable portion of Arthur's seat, near Edinburgh, is composed of this rock.

TRAPE'ZIUM (τραπέζιον, a little table). A term applied to any quadrilateral figure which is not a parallelogram; it is therefore inapplicable to the square, the oblong, the rhombus, and the rhomboid. Some writers apply the term *trapezoid* to a quadrilateral, which has only two sides parallel; and *trapezium* to a quadrilateral having two sides parallel and the other two equal, but not parallel. It has been proposed that *trapezium* should be the general word for *plane* quadrilateral figures, parallelograms included; and that *trapezoid* should denote a quadrilateral figure whose sides are not in the same plane.

TRASS. A deposit of volcanic ashes and scoriæ ejected from the Eifel volcanoes, and accumulated in valleys and old lakes under the influence of water. It is equivalent, or nearly so, to the puzzolana of the Neapolitans.

TRAUBEN-ERTZ. The massive botryoidal variety of green lead ore, one of the divisions of phosphate of lead or pyromorphite.

TRAUMATE. The name given by the French geologists to graywacké.

TRAVERSE. *Traverse-sailing*, or the working of a traverse, is the method of calculating a ship's place after she has made two or more short courses on different points of the compass.

TRAVERSE TABLE. A table used in traverse-sailing and for other purposes. It is a neat trigonometrical canon, as follows:—The angle a ship makes with the meridian is the angle of the course; the distance run in that course is the hypotenuse of a right-angled triangle, and the side opposite to the angle of the course is called the *departure* (from the meridian). The side adjacent to the angle of the course is called the *difference of latitude* (this being found from it by reducing miles or leagues to degrees). The traverse table is a table of double entry, into which, going with the angle of the course and the distance run, we find in two columns the corresponding departure, and length of the side, called difference of latitude.—*Pen. Cycl.*

TRAVERTIN. The Italian term for a white concretionary limestone, usually hard and semi-crystalline, deposited from the water of springs holding lime in solution. The term is not exactly equivalent to *tufa*, which expresses the loose and porous surface deposit from calcareous springs, while *travertin* denotes the more solid limestone, less frequently formed in lakes and on hill sides. This stone was called by the ancients Lapis Tiburtinus, being found in great quantity by the river Anio, at Tibur, near Rome. Some suppose travertin to be an abbreviation of *trasteverino* from transtiburtinus.

TREBLE. In Music, the highest part in a concerted piece. It is distinguished into the first or highest, and the second or low treble. *Half-treble*, or mezzo soprano, is a high counter-tenor.

TREMATO'DA (τρῆμα, a hole). An order of sterelminthans, a parenchymatous entozoa, furnished with organs of imbibition and adhesion in the form of suckers.

TRE'MOLITE. A sub-species of straight-edged augite, named from Val Tremola, where, however, it is not found. It is distinguished into the asbestous, the common, and the glassy varieties.

TRIAD, HARMONIC. In Music, a combination of three sounds which is naturally divisible into two-thirds, one major, the other minor, constituting a fifth in the whole. Its name is derived from its being formed of a third and a fifth, which, with the base or fundamental sound, make three different terms.

TRIADE'LPHOUS (τρεῖς, three, ἀδελφία, brotherhood). A term applied in Botany to the filaments of plants which are combined into three masses, or *brotherhoods*, as in some species of hypericum. See *Adelphia.*

TRIAKE'NIUM. The botanical designation of a fruit which consists of three achænia, or cells. See *Achænium.*

TRIA'NDRIA (τρεῖς, three, ἀνήρ, a man). The third class of plants in the system of Linnæus, comprising those which have three stamens.

TRI'ANGLE (*tres angulos* habens). A three-sided figure, having necessarily three corners or angles. When the lines forming the sides are straight, the figure, being on a plane, is called a *plane triangle;* when they are curved, lying on the surface of a sphere, the figure is a *spherical triangle.* A triangle is *equilateral,* when its three sides are equal; *isosceles*, when only two sides are equal; *scalene*, when all its sides are unequal; *right-angled*, when it has a right angle; *obtuse-angled*, when it has an obtuse angle; *acute-angled*, when it has three acute angles.

Triangle spherical. A figure drawn upon the superficies of a sphere, comprehended by three arcs of three great circles, each of which is less than a semicircle. In any right-angled spherical triangle, the complement of the hypotenuse, the complements of the angles, and the two sides, are called the *circular parts of the triangle*, as if they were following each other in a circular order, from whatever part we begin. Thus, if any three of these five be taken, they either will be all contiguous or adjacent, or one of them will not be contiguous to either of the other two: in the first case, the part which is between the other two is called the *middle part*, and the other two are called *adjacent extremes;* in the second case, the part which is not contiguous to either of the other two is called the *middle part*, and the other two *opposite extremes.*

TRIANGLE, ARITHMETICAL. A table of certain numbers disposed in the form of a triangle. The first column contains units only; the second, the series of consecutive numbers; the third, the series of triangular numbers; the fourth, the series of pyramidal numbers; and so on (See *Number*). The columns may be continued vertically to any extent—

1						
1	1					
1	2	1				
1	3	3	1			
1	4	6	4	1		
1	5	10	10	5	1	
1	6	15	20	15	6	1

Any number in the table is obtained by adding the number immediately above it in the same column, to the number in same horizontal line in the next preceding column; further, it will be found that the oblique diagonal rows, beginning from the left side, are the same as the vertical columns. One of the properties of the table is, that numbers taken on the horizontal lines, are the co-efficients of the different powers of a binomial.

TRIANGLE OF FORCES. The "Parallelogram of Forces" (See *Force*) may be stated under another form, termed the *triangle of forces;* for it is the same thing whether we say of three straight lines that they are the sides and diagonal of a parallelogram, or that they will form a triangle; hence we may assert, that forces will be in equilibrium when they are proportional to the sides of a triangle formed by drawing lines parallel to their directions.

TRIANGULAR COMPASSES. Compasses having three legs, capable of taking off three points at once, and used in the construction of maps and charts. Two of the legs open as in the common compasses, while the third turns round an extension of the central pin of the other two, besides having a motion on its own central joint.

TRIANGULAR NUMBERS. A series of numbers formed by the successive sums of the terms of an arithmetical progression, of which the common difference is 1. Thus—

Arith. Progression 1, 2, 3, 4, 5, 6, &c.
Triangular Numbers 1, 3, 6, 10, 15, 21, &c.

The general formula for the series is $\frac{1}{2} n (n + 1)$. See *Number.*

TRIANGULA'TION. A name given to the net-work of triangles with which the face of a country is covered in a trigonometrical survey.

TRIA'NGULUM. The triangle; a northern constellation, consisting of sixteen stars, surrounded by Perseus, Andromeda, Aries, and Musca. The *triangulum australe* is a modern southern constellation, consisting of five stars, lying between Ara, Centaurus, and the South Pole.

TRIA'SSIC SYSTEM. New red sandstone and saliferous marls. A geological system, forming the base of the great central plains of England, and surmounted by the saliferous marls and red arenaceous beds which pass under the great oolitic terrace, or rather the succession of terraces which stretch across England from the coast of Devonshire to the north-eastern coast of Yorkshire.

TRIBA'SIC SALTS. The name given to a class of oxygen-acid salts, which, in the language of the old theory, contain three atoms of base to one of acid, and of which the tribasic phosphates are the type.

TRICA. *Gyroma.* In the botanical nomenclature of lichens, this term denotes a shield, the surface of which is covered with sinuous concentric furrows.

TRICHI'DIUM (*τριχίδιον*, from *θριξ*, a hair). *Pecten.* A botanical term for a tender, simple, or sometimes branched hair, which supports the sporules of some fungaceous plants, as geastrum.

TRICHO'PTERA (*θρὶξ, τριχὸς*, hair, *πτερὸν*, a wing). An order of insects, distinguished by the hairy covering of their wings and bodies. Their larvæ are well known under the name of *caddice-worms.*

TRICHO'TOMOUS (τριχα, in three parts, τέμνω, to cut). A designation of the mode of branching or of inflorescence, when the divisions occur in *threes,* as in the stem of Marvel of Peru.

TRIDACNI'DÆ. The name given by Lamarck to a family belonging to the first section of his monomyarian conchifers, or mollusks furnished with bivalve shells which have a single muscular impression. This family comprises the genera *tridacna* and *hippopus.*

TRIFID, TRISECTED, TRIPARTED, &c. These and other terms are applied by botanists to the forms of leaves, with especial reference to the number and the depth of their lobes, according as they have, respectively, fissures, segments, or partitions. And, on the other hand, we may, by neglecting the number of the lobes, simply indicate their presence by saying that a leaf is *pinnatilobed, palmatilobed,* and so on. The lobes themselves are sometimes subdivided upon the same principle as the leaf itself: thus we say that a leaf is *tripinnatisected, tripinnatiparted, tripinnatifid,* when the subdivisions of the lobes are themselves lobed.

TRI'GLIDÆ. The Gurnard tribe of acanthopterygious or spiny-finned fishes, generally resembling the Percidæ, but having their head armed with spines or hard scaly plates.

TRIGO'NIDÆ (τρίγωνος, triangular). A family of conchiferous mollusks, named from the genus *trigonia,* the shell of which is of a subtrigonal form.

TRIGONO'METRY (τρίγωνον, a triangle, μετρέω, to measure). This term originally denoted simply the science by which those relations are determined which the sides and angles of a triangle have to each other, being called *plane* or *spherical* trigonometry, according as the triangle was described on a plane or a spherical surface. By means of certain proportions always holding good between the three sides and the three angles of a triangle, we are enabled, by the aid of this branch of mathematics, when any three of these six quantities are known (provided that one of these known quantities be a side), to find the other three. At present, the term has a much more extensive meaning, as the science now embraces all the theorems expressing the relations between angles and certain functions of them; it embraces the consideration of alternating and periodic magnitude; in which quantity is imagined to go through alterations of increase and diminution without end.

1. *Definitions of Trigonometrical Lines.* 1. The *complement* of an arc is its difference from a quadrant; and that of an angle, its difference from a right angle. 2. The *supplement* of an arc is its defect from a semicircle; and that of an angle, its defect from two right angles. 3. The *sine* of an arc is a line drawn from one of its extremities, perpendicular to the radius passing through its other extremity. 4. The *tangent* of an arc is a line touching it at one extremity, and limited by the radius produced through its other extremity. 5. The *secant* of an arc is that portion of the radius produced, which is intercepted between the extremity of the tangent and the centre. 6. The *versed sine* of an arc is that portion of the radius intercepted between the sine and the extremity of the arc. 7. The *supplemental versed sine,* or *suversed sine* is the difference between the versed sine and the diameter. 8. The sine, tangent, &c. of the complement of an arc, are concisely termed the *cosine, cotangent,* &c. of that arc. These terms, for conciseness, are usually contracted into sin., tan., sec., vers., suvers, cos., cot., cosec., covers., and cosuvers.

2. *Trigonometrical Functions of an Angle.* 1. The ratio which the sine of an angle bears to its cosine is called the *tangent* of the angle. 2. The inverse of this ratio is called the *cotangent.* 3. The ratio of unity to the cosine of an angle is denominated the *secant;* and that of unity to the sine, the *cosecant.* 4. The difference between unity and the cosine is called the *versed sine.* 5. The difference between unity and the sine of an angle is called the *coversed sine.* These are functions of the *angle,* and are quite independent of the absolute length of the arc subtending it, or of the radius of that arc.

3. *Signs of the trigonometrical lines.* The signs + and −, which in arithmetic indicate addition and subtraction, are used in geometry to point out opposition in direction. Quantities whose signs are +, are called *positive,* and those whose signs are —, are called *negative.* If a line be measured from a given point or a given line as its origin, it is reckoned *positive* when it lies on one side of its

origin, and *negative* when on the opposite side.

4. *Trigonometrical Tables.* There are two kinds of trigonometrical tables. The first kind contains the sines, cosines, &c. of angles, calculated to the radius unity; the sines, cosines, tangents, and secants in these tables to radius 1, are called *natural*, to distinguish them from those of the second kind, which are called *artificial* or *logarithmic*. By aid of the latter tables, instead of multiplying natural sines, &c., we need only add the logarithmic sines, &c.; and, instead of dividing a natural sine or cosine, &c. by another, we need only subtract the logarithmic sine, &c., which represents the dividend. By these operations much time and labour are saved.

5. *Trigonometrical Canon.* This is a table, which, beginning from one second or one minute, orderly expresses the lengths which every sign, tangent, and secant have, in respect of the radius, which is supposed unity; and is conceived to be divided into 10,000,000 or more decimal parts. And so the sine, tangent, or secant of an arc, may be had by the help of this table; and, contrariwise, a sine, tangent, or secant being given, we may find the arc it expresses.

6. *Trigonometrical Curves and Series.* The former are curves having such equations as $y = \sin x$, $y = \cos x$, $y = a \cos x + b \cos 2x$, &c. The latter are infinite series of the form $a \sin x + b \sin 2x + c \sin 3x +$ &c., and $a \cos x + b \cos 2x + c \cos 3x +$ &c.

7. *Trigonometrical Survey.* The application of trigonometry to geodetic operations, for topographical purposes, and for measurements connected with general geography and with the figure of the earth.

TRIGY'NIA (τρεῖς, three, γυνὴ, a woman). The name given by Linnæus to those *orders* of plants which have three pistils.

TRILLION. A million of billions, or a million of million of millions.

TRI'LOBITE (τρεῖς, three, λοβὸς, a lobe). An extinct crustacean animal, almost the sole representative of its class in the periods which intervened between the deposition of the earliest fossiliferous strata and the end of the coal formation. It is named from the upper surface of its body being divided into three lobes.

TRI'MERA (τρεῖς, three, μέρος, a part). A section of coleopterous insects, in which only three ordinary-sized joints exist in the tarsi, the fourth being minute and indistinct. *Latreille.*

TRIMYA'RIANS (τρεῖς, three, μῦς, a muscle). A designation of those bivalves which present three muscular impressions on each valve.

TRI'NGIDÆ. A group of birds, distinguished from all others by the great length, the slenderness, and the flexibility of the bill, no less than by the delicacy of the legs and the smallness of the hinder toe. The *tringa*, or sandpiper, is the type of the group. They belong to the family Scolopacidæ.

TRINO'MIAL. An algebraical name for an expression consisting of three terms, as $a + b + c$, or $ax - bx^3 + bx^4$.

TRIPHANE. *Spodumene.* A silicate of lithia and alumina, first discovered in the island of Uton in Sudermannland, where it is associated with red felspar and quartz, and lately by Dr. Taylor in the vicinity of Dublin.

TRIPHYLINE. A phosphate of iron, manganese, and lithia.

TRIPI'NNATE; TRITE'RNATE. 1. The former of these terms is applied by botanical writers to a leaf in which there are three series of pinnation, as when the leaflets of a bipinnate leaf are themselves pinnate. 2. The latter term denotes a leaf in which there are three series of ternation, as when the leaflets of a biternate leaf are themselves ternate.

TRIPLE SALTS. A term sometimes applied, in chemistry, to salts in which two bases are combined with one acid, as soda and potassa with tartaric acid in Rochelle salt. These compounds are, however, more commonly viewed as *double salts*, Rochelle salt being considered as composed of single equivalents of the tartrates of soda and potassa.

TRI'PLICATE RATIO. The composition of a ratio with itself *twice:* thus the ratio of a^3 to b^3 is the triplicate of the ratio of a to b. In other words, the triplicate of a given ratio is found by taking the cube of each of the terms of the ratio. Thus, when it is said that two similar solids, whose linear dimensions are as 6 to 9, are in the triplicate ratio of 6 to 9, it is meant that the contents of these solids are in the ratio of $6 \times 6 \times 6$ to $9 \times 9 \times 9$, or 216 to 729.

TRIPLITE. Phosphate of manganese, found at Chanteloube, near Limoges, in the department of Haute Vienne in France, where several other mineral substances have lately been found, the essential constituents of which are iron, manganese, and phosphoric acid.

TRI'POLI. A powder used for polishing metals and stones, first imported from Tripoli, which, as well as a certain kind of siliceous stone of the same name, has been lately found to be composed of the flinty cases of infusoria. It is found at Bakewell, in Derbyshire, where it is called *rotten-stone.*

TRITO'XIDE. An oxide containing one atom of base combined with three atoms of oxygen.

TRO'CHIDÆ. A family of phytophagous Gasteropods, which have a turbinate, mostly trochiform, or top-like shell, the substance of which is almost always perlaceous; the outer lip never thickened; the aperture entire, closed by a shelly or horny operculum.

TROCHI'LIDÆ (*trochilus*, a humming-bird). The Humming-bird tribe; a family of the *Insessores*, or Perching-birds, characterized by the brilliancy of their plumage, and by the humming sound which accompanies their flight. See *Tenuirostres.*

TROCHI'NÆ. Trochuses, or Top-shells; a sub-family of the *Trochidæ*, named from the genus *trochus;* the shape of these shells is pyramidal, the body-whorl flattened, and the aperture closed by a horny operculum.

TRO'CHOID (τροχὸς, a wheel, εἶδος, likeness). A curve described by any point in a wheel as it rolls forward on a plane. The term is synonymous with *cycloid.*

TROCHOI'DAL CURVES (τροχὸς, a wheel or hoop, εἶδος, likeness). "Under this term is included a large number of lines which are produced by the composition of two circular motions, including the straight line, the circle, the ellipse, a class of curves called epitrochoids, of which one particular case is called the epicycloid, and a class called hypotrochoids, of which one particular case is the hypocloid. Among these must also be included the extreme case in which one of the motions is rectilinear, which gives the common trochoid, the cycloid, and a class of spirals which includes the involute of the circle, the spiral of Archimedes, and others."—*Pen. Cycl.*

Trochoidal and Planetary Motions. In the *trochoidal* motion, which is universally adopted, one circle is made to roll like a hoop, either upon a straight line, or upon the circumference of another circle. The *planetary* motion resembles that in which a planet and its satellite move round the sun. Here a circle, without any rolling, has its centre carried round the circumference of another.

TROGO'NIDÆ. A family of the Insessores, or Perching-birds, remarkable for the beauty of their plumage, comprising the woodpecker, the cuckoos, the trogons, the toucans, &c.

TRONA. The name given in Africa to the sesqui-carbonate of soda, imported from the coast of Barbary, where it is collected by the natives.

TRO'PHI (τρόφος, a nourisher). *Instrumenta cibaria.* In insects, the organs which form the mouth, consisting of an upper and an under lip, and comprising the mandibles, maxillæ, and palpi, or the parts employed in acquiring and preparing food.

TROPHOPOLLEN. The name given by Turpin to the *septum* of the anther of plants, from which the pollen has been incorrectly supposed to separate. By others, this part has been termed the *receptacle* of the *pollen*, and by Link the *raphe.*

TRO'PHOSPERM (τρέφω, to nourish, σπέρμα, seed). The name given by Richard to the placenta in plants, the part from which the ovules arise. It generally occupies the whole or a portion of one angle of each cell.

TROPICS (τροπικὸς, from τρέπω, to turn). Those two circles on the earth, over which the sun seems directly to pass, when he is at the greatest distance from the equator northward and southward (viz. 23½ degrees); hence, the one is called the Northern, the other the Southern Tropic. They correspond to the sun's position at the solstices, and are the limits of the torrid zone.

1. *Tropic of Cancer.* A designation of the Northern Tropic, because, when the sun appears to move vertically over this tropic, he appears to be in the beginning of Cancer.

2. *Tropic of Capricorn.* A designation of the Southern Tropic, because, when the sun appears to move vertically over this tropic, he appears to be in the beginning of Capricorn.

3. The term *Tropic* denotes a point where a *turn* is made; for the line of the ecliptic quitting the equator in the first point of *Aries*, continues to rise higher northward from it till it reaches the first point of *Cancer*, when it *turns* to the southward; and, after again cutting the

equator at the first point of Libra, continues to descend southward till it reaches the first point of *Capricorn*, when it again *turns* to the northward and reaches Aries.

TROPICAL YEAR. The period of time which intervenes between two coincidences of the sun with the vernal equinox. This is the common or civil year, in which the phenomena of the seasons are repeated, and after which they recommence. It depends chiefly and directly on the annual revolution of the earth round the sun, but subordinately also, and indirectly, on its rotation round its own axis, which occasions the precession of the equinoxes. It consists of 365d. 5h. 48m. 49s. 7; it is, therefore, shorter than the *sidereal year*, or the period of the actual revolution of the earth round the sun, by 4′ 39″. 7. See *Anomalistic Year*.

TROUGH APPARATUS. Oersted's *trough apparatus* is essentially the same as Wollaston's battery. It consists of a trough of copper plate, in the form of a parallelopiped, about ½ an inch wide at the bottom; in it the zinc plates are arranged so as not to touch the copper; the trough serves also to hold the liquid.

TROUGH, PNEUMATIC. A vessel made of tinned iron for collecting gases. It has a moveable stage or *bridge*, above which water is to be poured to the height of about an inch. The bridge is perforated by a round hole, communicating above with an inverted receiver, into which it transmits the gas conveyed to it by a tube beneath the surface of the water.

TRUE PLACE. In Astronomy, the place which a star or planet appears to occupy in the heavens is not called its *true place*, but that which it would occupy if corrections were made for parallax, refraction, &c.; that is, if the spectator made his observation from the centre of the earth, and without the light passing through a refracting medium.

TRUMPET. The *speaking trumpet* is an instrument, best when made of a parabolic form, for rendering the human voice audible at a great distance. This object is accomplished by the rays of sound being reflected from the interior of the trumpet, as the words are spoken at the smaller end, in such a manner that they issue from the expanded mouth *parallel to each other*, and consequently agitate the air in the direction in which the axis of the trumpet is held, more forcibly than they would had they proceeded immediately from the mouth of the speaker. The efficiency of this instrument increases with its length: a strong man's voice, sent through a trumpet from 18 to 24 feet in length, may be heard at a distance of 3 miles.

The *hearing trumpet* inverts the operation above described, the rays of sound being received at the large opening, and reflected so as to become united at the small aperture which is inserted into the ear.

TRUNK; STEM; &c. The former term is applied by botanists to the main stem of trees; while the latter is generally used to denote the ascending axis of herbaceous plants or shrubs, but not of trees. The *culm* or *straw* is the stem of grasses; to these terms De Candolle adds *calamus*, applying it to all fistular simple stems without articulations, as those of rushes.

TRUTH. This term, in its strict logical sense, applies to propositions and to nothing else; and consists in the conformity of the declaration made to the actual state of the case; agreeably to Aldrich's definition of a "true" proposition—vera est, quæ *quod res est* dicit. It would be an advantage, observes Whately, if the word Trueness or Verity could be introduced and employed in this sense, since the word Truth is so often used to denote the "true" *proposition itself*. "What I tell you is the *Truth;* the *Truth* of what I say shall be proved:" the term is here used in these two senses.

1. Truth, in its etymological sense, signifies that which the speaker "trows," or believes to be the fact. The etymology of the word ἄληθες seems to be similar, denoting *non-concealment*. In this sense it is opposed to a *lie;* and may be called moral, as the other may logical, truth. A witness therefore may comply with his oath to speak the truth, though it so happen that he is *mistaken* in some particular of his evidence, provided he is fully convinced that the thing is as he states it.

2. Truth is not unfrequently applied, in loose and inaccurate language, to *arguments;* where the proper expression would be "Correctness," "conclusiveness," or "validity."

3. Truth, again, is often used in the sense of *Reality*, *τὸ ὄν*. Persons speak of the truth or falsity of *facts;* properly speaking, they are either *real* or *fic-*

titious: it is the *statement* that is either "true" or "false." The "true" *cause* of any thing, is a common expression; meaning "that which may with truth be assigned as the cause." The senses of falsehood correspond. *Whately.*

TRYMA. The botanical designation of a syncarpous fruit, which is superior, by abortion one-celled, one-seeded, with a two-valved indehiscent endocarp, and a coriaceous or fleshy valveless sarcocarp, as in walnut.

TUBE. The surface of a tube is generally a cylinder, but this word may be made use of in mathematics. When a tube is bent, there is no distinct geometrical name for it, but the following definition might do very well: let a surface be called a tube when it is formed by a circle which moves with its centre upon a given curve, and its plane always perpendicular to the tangent of that curve. This would include the straight tube, or common circular cylinder, and every species of bent tube.—*Pen. Cycl.*

TUBE OF SAFETY. A tube open at both ends, inserted into a receiver, the upper end communicating with the external air, and the lower being immersed in water. Its intention is to prevent injury from too sudden condensation or rarefaction taking place during chemical operations; for, if a vacuum be produced within the vessels, the external air will enter through the tube: and if air be generated, the water will yield to the pressure, being forced up the tube. Thus, too, the height of the water in the tube indicates the degree of pressure from the confined gas or gases.

TUBER. An annual thickened subterranean stem, provided at the sides with latent buds, from which new plants are produced, as in the potato. When very small it is called *tubercle.*

TUBI'COLÆ (*tubus*, a tube, *colo*, to inhabit). An order of Annellida, or red-blooded worms, enclosed in an elongated tube, which is formed either by the agglutination of foreign matters, or by the secretion of calcareous matter resembling that of the shells of certain bivalves. These are the *Pinceaux de Mer* of the French.

The term *Tubicola* also denotes a family of Spiders, which enclose themselves in a silken tube, strengthened externally by leaves or other foreign substances.

TU'BICORNS (*tubus*, a tube, *cornu*, a horn). A family of the Ruminantia, in which the horns are composed of a horny axis covered with a horny sheath.

TUBIPO'RIDÆ (*tubus*, a tube, *porus*, a pore). A class of polyps, enclosed in a calcareous or coriaceous sheath or tube, from the orifice of which the polyp is protruded when in search of prey. These are called *vaginated-polyps.*

TUBI'PORITES. The name given to the fossil species supposed to belong to *tubipora.*

TU'BIVALVES (*tubus*, a tube, *valvæ*, folding-doors). *Tubicolidæ.* A designation of those bivalves which are furnished with a testaceous tube, as *teredo.* The animals of this family are borers, burrowing in stone, wood, and even in thick shell; but some, nevertheless, live in the sand.

TU'BULATURE (*tubulus*, a little tube). The mouth, or short neck, at the upper part of a tubulated retort. The long neck is called the *beak.*

TU'BULIBRANCHIA'TA (*tubulus*, a little tube, *branchiæ*, gills). An order of gasteropods, the shells of which consist of long and irregular tubes usually fixed to foreign bodies, but having the earliest formed portion twisted into a few spiral curves, as in vermetus.

TU'BULIPO'RIDÆ. A family of the Polypiaria solida of Blainville, who describes them, as animals contained in cells of a tubular figure, with a round mouth, which are accumulated irregularly, so as to form an attached solid polyparium. The animals are known only in the genus *tubulipora*

TUFA, or TUFF, VOLCANIC. A variety of volcanic rock, of an earthy texture, seldom very compact, composed of agglutinated fragments of scoriæ and loose materials ejected from volcanoes.

1. *Tufa, calcareous.* A porous rock deposited by calcareous waters on their exposure to the air, and usually containing portions of plants and other organic substances incrusted with carbonate of lime. The more solid form of the same deposit is called *travertin*, into which it passes.

2. *Tufa, trachytic.* Beds and irregular deposits of conglomerate, composed of fragments of trachyte and other volcanic substances, are often abundant in volcanic districts. When reduced to the state of sand or powder, they form beds of tufa, analogous to those of the trap series.

TUNGSTEN. A Swedish term, signifying *heavy stone*, and applied to an element which exists in the form of tungstic acid in several minerals, the most important of which are the native tungstate of lime, also called *scheelite;* and the tungstate of manganese and iron, also called *wolfram.* The tungstate of lead, or *scheel-lead ore,* was formerly confounded with the molybdate of this metal.

TUNICA'TA (*tunica,* a tunic). The first class of the mollusca, comprising soft, aquatic, acephalous animals, having their body enveloped in an elastic tunic, furnished with at least two apertures. They are distinguished into two orders, viz. the *Salparia,* in which the forms are organically united; and the *Ascidiaria,* which continue isolated by their external tunic.

TUPAI'ADÆ. The Bangsrings; a family of insectivorous vertebrate animals, consisting of the single genus *tupaia.* They are confined to the Indian Archipelago, where, contrary to the usual habits of the insectivora, they live in trees, which they ascend with the agility of quadrumanous animals.

TU'RBIDÆ. Marine snails; a family of phytophagous gasteropods, which breathe by gills, and often exhibit the carnivorous structure of the zoophagous division of gasteropods. The shell is solid, but not perlaceous, spiral; the aperture entire, closed by an operculum.

TURBI'NÆ. Winkles; a sub-family of the *Turbidæ,* named from the typical genus *turbo;* these are all marine shells, with a perfectly entire aperture.

TU'RBINATED (*turbo,* a top). A term applied to shells which have a spiral or screw-form structure, as that of the garden-snail.

TURBINE'LLIDÆ. Turnip-shells; a family of carnivorous gasteropods, in which the base of the shell is straight and lengthened, and the pillar strongly plaited. The mantle of the animal is never dilated, but is of ordinary dimensions, and drawn back into the shell with the animal.

TURBINELLI'NÆ. A sub-family of the *Turbinellidæ,* or Turnip-shells, named from the typical genus *turbinella,* and characterized by the great size, weight, and smoothness of the shell, the great length of the canal, and the generally papillary state of the spire.

TURBI'NIDÆ. A family of gastropodous mollusks, named from the genus *turbo.* According to Linnæus, the *animal* is a limax or slug; the *shell* is univalve, spiral, solid; the *aperture* narrowed, orbiculate, entire. Lamarck gives the name *Turbinacea* to the last family of his herbivorous trachelipods; all are marine shells, appearing to be provided with an operculum.

TURDI'NÆ (*turdus,* a thrush). Turdine birds or thrushes; a family of the *Cantatrices* of Macgillivray, which have a moderately rapid, somewhat undulated flight, and on the ground advance by leaping. Most of the species are remarkable for their superiority of song.

TURIO. The botanical term for a scaly bud, developed from a perennial subterranean root, as in asparagus.

TURKEY-SLATE. *Whet-slate; Novaculite.* A massive greenish-grey mineral, occurring in beds in primitive and transition clay-slate. Very fine varieties are brought from Turkey, called hone-stones. It is used for sharpening steel instruments.

TU'RMERIC. The tuber of the *curcuma longa,* which yields a beautiful bright yellow colour. *Turmeric paper* is unsized paper, brushed over with tincture of turmeric, prepared by digesting one part of bruised turmeric in six parts of proof spirit.

TURNBULL'S BLUE. *Ferricyanide of iron.* A blue precipitate which is thrown down when red prussiate of potash is added to a protosalt of tin.

TU'RNERITE. A rare mineral, containing alumina, lime, magnesia, and iron, found only on Mount Sorel in Dauphiny.

TURNER'S YELLOW. *Cassel Yellow; Patent Yellow.* An oxichloride of lead.

TURNSOLE. A deep purple dye obtained from the *crozophora tinctoria,* an euphorbiaceous plant.

TURPETH MINERAL. The name given by chemists to the sub-sulphate of mercury.

TURQUOIS. *Calaite; Odontalite.* An opaque gem found chiefly at Nishapur, in the province of Khorasan, in nodules or as small veins traversing a ferrugino-argillaceous rock, and greatly esteemed on account of its beautiful blue colour, which will in most cases be sufficient to distinguish it both from the blue silicate of copper, and from fossil bones (particularly teeth) impregnated with blue phosphate of iron or carbonate of copper —the occidental turquoises of lapidaries.

TU'RRILITE. An extinct genus of spiral, turreted, chambered shells, allied to the ammonites, having the siphunicle near the dorsal margin.

TU'TENAG. The commercial name for the zinc or spelter of China, an alloy used in the manufacture of the *gong;* also the name of a white metallic compound, called *Chinese copper*. Impure oxide of zinc is called *tutty*.

TWILIGHT. A phenomenon depending on reflection of the rays of light passing through the atmosphere. Before the sun becomes visible above the horizon, the rays of light illuminate the atmosphere, which to some extent reflects and scatters them in all directions, and the result is a faint light which precedes the rising of the sun and follows its setting, and which we call *twilight*. Twilight begins and terminates when the sun is about 18° below the horizon; its duration varies with the latitude; in some northern latitudes it may endure all night. The luminous lines occasionally seen in the air, in a sky full of partially broken clouds, which the vulgar term "the sun drawing water," are similarly caused.

TYCHONIC SYSTEM. A system of Astronomy, so named from Tycho Brahe, a noble Dane, who was born A.D. 1546, and who partly restored the system of Ptolemy concerning *the earth remaining at rest, whilst the other heavenly bodies moved round it*. He taught, however, that the moon performed a monthly revolution round the earth; that the sun was the centre of the orbits of Mercury, Venus, Mars, Jupiter, and Saturn, which revolve round him in their respective periods, as he revolves round the earth in a solar year; and accordingly, that these five planets, together with the sun, are carried round the earth in twenty-four hours.

TYPE METAL. An alloy of lead and antimony, used in casting printer's types.

TYPHLOPHTHA'LMES (τυφλὸς, blind, ὀφθαλμὸς, the eye). A family of *Scincoidans*, comprising those Saurians which are completely blind, or whose eyes are so small that they seem scarcely to exist, except in a rudimentary state, and entirely covered with skin, as in the genera dibamus and typhline.

TYPHOON (τυφὼν, a whirlwind). A hot wind which occasionally blows with great violence in Africa, Syria, Arabia, and Persia. It is known in Egypt by the name of *sirocco*, in Arabia as the *simoon*, and on the coast of Guinea as the *harmattan*. The term is frequently applied to a tropical storm.

U

ULLMANNITE. Phosphate of manganese and iron, occurring massive at Limoges in France.

ULMA'CEÆ (*ulmus*, the elm). The Elm tribe of Dicotyledonous plants. Trees and shrubs with *leaves* alternate; *flowers* apetalous; *ovarium* superior; *fruit* 1 or 2-celled, indehiscent; *seeds* pendulous.

ULMIC ACID, or ULMIN (*ulmus*, the elm). The name given by Dr. Thomson to a brown substance derived from a secretion of the elm and some other trees, consisting of mucilaginous matter combined with potash. Berzelius changed the name for that of *geic acid* (γῆ, earth), because, on treating soils with alkalis, a considerable quantity of a similar compound is obtained. The peculiar properties of manures, soils, and what is called *moss-water*, are due to the presence of this substance.

Sacchulmic acid. This substance, and *sacchulmine*, are formed by boiling cane sugar for a very long time in dilute sulphuric, hydrochloric, or nitric acid. They were supposed to be identical with *ulmic acid* and *ulmin*, but Liebig considered them to be of a different nature, and gave them their present names.

ULTIMATE ANALYSIS. In chemistry, the resolution of substances into their absolute elements, as opposed to *proximate analysis*, by which they are merely resolved into secondary compounds. These terms are generally used in reference to organic bodies. Gum, starch, &c., are proximate principles; carbon, hydrogen, and oxygen, ultimate principles.

ULTIMATE RATIO. The ratio of evanescent quantities. If two variable quantities be supposed constantly to approach each other in value, so that their ratio or quotient continually approaches to unity, and at last differs from unity by less than any assignable quantity, the *ultimate ratio* of these two quantities is said to be a ratio of equality. The method of *prime* and *ultimate ratios* was introduced by Newton, and the terms relate to the ratios of variable quantities considered as receding from, or approaching to, the ratios of the *limits* to which they continually and simultaneously approach.

ULTRAMARINE. A blue pigment of great permanence, prepared entirely, until lately, from the lapis lazuli or lazulite. It is now made of silica, alumina, soda, and sulphur.

ULVA'CEÆ (*ulva*, laver). A tribe of cryptogamic plants belonging to the inarticulate division of the order *Algaceæ*. They comprise plants found in fresh and salt water, with a membranous, reticulated structure, and the reproductive organs imbedded in the substance of the plant. They are the lavers, the sea-purse, the water-gut, &c.

UMBEL (*umbella*, an umbrella). A form of inflorescence, in which all the pedicels of the flowers proceed from a single point, and are of equal length or corymbose. When each pedicel bears a single flower, as in Eryngium, the umbel is said to be *simple;* when each pedicel divides, and bears other umbels, as in Heracleum, the umbel is termed *compound*. In the latter case, the assemblage of umbels is called the *universal umbel*, each of the secondary umbels being called the *partial umbel*. The peduncles which support the partial umbels are called *radii*.

UMBELLI'FERÆ (*umbella*, an umbel, *fero*, to bear). The Umbel-bearing tribe of Dicotyledonous plants. Herbaceous plants, with *leaves* usually divided; *flowers* in umbels; *calyx* entire or 5-toothed; *petals* 5, alternate with 5 *stamens; ovarium* didymous, with 2 *styles* and solitary pendulous *ovula*.

UMBER. An ore of iron and manganese, occurring in beds with brown jasper in the isle of Cyprus, and used as a brown pigment.

UMBILI'CUS (dim. of *umbo*, the boss of a shield). 1. A term applied in conchology to the hollow axis of those spiral shells in which the inner sides of the whorls or volutions do not touch one another. 2. In Botany, the term is synonymous with *hilum*, and denotes the scar where the seed is united with the placenta. 3. The term has sometimes been applied to the focus of an ellipse; but, in modern works, it signifies a point of a surface through which all its lines of curvature pass. At such a point the two principal curvatures are equal.

UMBO. Literally, the boss of a shield; hence applied, in conchology, to that point in a conchifer or bivalve shell which constitutes the nucleus or apex of each valve, and which is generally situated above the hinge, and always near it.

UMBRA. A shadow; the shadow of the earth or of the moon in an eclipse. See *Penumbra*.

U'NCIÆ. The name given by the old algebraists to the coefficients of the letters in the expansion of any power of a binomial.

UNCONFORMABLE. A term applied to a set of geological strata, when their planes are not parallel to those of another set which are in contact. See *Conformable*.

UNDE'CAGON (*undecim*, eleven, *γωνία*, an angle). A barbarous term for a plane figure bounded by eleven sides, and, consequently, containing eleven angles. *Endecagon* is classical.

UNDER-SHRUB. *Suffrutex*. The under-shrub differs from the *shrub* in perishing annually, either wholly or in part; and from the *herb*, in having branches of a woody texture, which frequently exist more than one year. It is exactly intermediate between the shrub and the herb; such is the mignionette in its native country, or in the state in which it is known as the Tree Mignionette.

UNDETE'RMINED. This word is applied in Mathematics to a number which has not been determined, but is capable of being determined; whereas an *indeterminate* number is one which cannot be determined at all in the given case.

UNDULATED (*undula*, a little wave). Wavy; a term nearly synonymous with *sinuated*, but more particularly applied to the colouring of shells.

UNDULA'TION (*undula*, a little wave). A tremulous motion or vibration observable in a fluid, whereby it alternately rises and falls like the waves of the sea. The constituent particles of all bodies are usually held, by the operation of certain internal and external forces, in a state of equilibrium; and, where these particles have been to a certain extent disturbed by any cause, they return to the state of equilibrium, by alternately approaching the position of rest and receding from it, until, by a gradually decreasing recession, they attain the condition of repose. These movements are called *undulations*, *vibrations*, or *oscillations*.

1. *Progressive undulation*. In this kind of movement, the undulation successively traverses the different parts of the body; those particles which have been immediately excited by the disturbing cause communicating motion to those which are next to them, and so on. In this case the movement of the particles is successive, so that the position they assume at any particular moment during the continuance of their motion, appears to advance from one place to another.

2. *Stationary undulation*. In this kind of movement all the particles of a body begin their undulations simultaneously, and complete them at the same instant. Even when the body is divided into several vibrating portions, each of them ceases to move independently of the rest, the different parts of the body being separated by points which remain throughout in a state of rest.

U'NDULATORY THEORY (*undula*, a little wave). A theory for explaining the nature of *light*. According to this, light has no material existence, but its phenomena are produced by the vibrations, or *undulations*, of a subtle ethereal fluid, diffused through all nature, and set in motion by the presence of luminous bodies. The phenomena of vision are thus produced by pulsations of ether on the retina of the eye, as those of sound are by pulsations of air on the nerve of hearing. See *Emission*.

UNEQUALLY PINNATE. *Imparipinnate*. That modification of the pinnate leaf, in which an odd leaflet terminates the petiole.

UNGUICULA'TA (*unguis*, a claw). Clawed animals; a section of the Mammalia, comprising those which have the digits armed with claws, but free for the exercise of touch upon their under surface. The feet of these animals are *bifid* in the camel, *multifid* in the elephant, the ape, &c.

UNGUIS. The Latin term for a nail. In Botany, it denotes the lower part of a petal which tapers conspicuously towards the base, as in the pink. The upper part is called the *limb*. The petal itself is termed *unguiculate*.

U'NGULA. A hoof; and, from the resemblance of this part of the animal to that part of a cone which is separated from the portion containing the vertex by an oblique plane, such a solid is called an *ungula*, and rules for determining its content are given in books of mensuration.

UNGULA'TA (*ungula*, a hoof). Hoofed animals; a section of the Mammalia, comprising those species which have the digits enclosed in hoofs, the under surface not being left free for the exercise of touch. The hoof is *solidipedous* in the horse, *bisulcate* in the ox, the goat, &c.

U'NIFORM. Though this word means nothing more than "of one form," it has a signification in mathematics which might be better rendered by "of one value," or "of one degree," when we speak to the mathematical proficient. But it is a convenience, though only an accidental one. that the word does not imply the idea of value absolutely. *Pen. Cycl.*

UNILO'CULAR (*unus loculus*, one cell). The designation of shells which are not divided into chambers; of seed-vessels which are not separated into cells.

UNIO'NIDÆ. River Mussels or Unios; a family of atrachian bivalves, which unite the atrachian with the macrotrachian mollusca.

UNIPE'LTATES (*una pelta*, one buckler). A family of stomapodous crustaceans, including those in which the carapace is composed of a single shield-like plate.

UNIPO'LAR. A term applied by Ehrman to substances of imperfect conducting power, which are capable of receiving only one kind of electricity, when made to form links in the voltaic chain.

UNIT JAR. An apparatus contrived by Mr. Harris for charging Leyden jars with known proportions of electricity, the quantity of electricity employed being proportioned to the number of charges.

UNIT OF MEASURE. A term applied in Geometry to a line by which another is measured; that is, which is applied to another line, in order to determine the number of times that the latter contains it. The *primary unit* by which angles and their corresponding arcs are numerically expressed, is the *degree* or the ninetieth part of a right angle or of a quadrant.

UNIVALVES (*unus*, one, *valvæ*, folding-doors). A class of mollusks, whose shell is composed of one piece, generally with spiral volutions.

UNIVERSAL PROPOSITION. A proposition whose predicate is affirmed or denied of the whole of the subject. Thus, in the language of logic, we have *universal affirmative* and *universal negative* propositions, in which the universal signs "all," "no," "every," are employed to indicate that the subject is distributed.

UNIVERSE; WORLD. The former of these terms usually relates to all created things, and hence the *theory of the Universe* comprises all that is known or conceived of the general arrangement of the stars, planets, &c. The term *world* was formerly synonymous with the present term *universe*, but is now commonly restricted to our own planet.

UNI'VOCAL NOUN. In Logic, a common term is called *univocal* in respect of those things or persons to which it is applicable in the same signification, as the term "man." Whately observes that "the usual divisions of nouns into *univocal*, *equivocal*, and *analogous*, and into nouns of the *first* and *second intention*, are not, strictly speaking, divisions of *words*, but divisions of the *manner of employing* them; the *same* word may be employed either univocally, equivocally, or analogously; either in the first intention or in the second. The ordinary logical treatises often occasion great perplexity to the learner, by not noticing this circumstance, but rather leading him to suppose the contrary."

UNLIMITED. A term sometimes employed by mathematicians in the sense of *indefinite*, in order to avoid the use of the word *infinite*. It is also used to describe a problem which may admit of an infinite number of answers.

UNSTRA'TIFIED ROCKS. Rocks which are not disposed in beds or *strata*. These are also called *massive* and *overlying* rocks, and comprise those usually termed Plutonic, Igneous, Trap, &c. Many of these are so intimately related to granite, as scarcely to be distinguished from it, while others as obviously pass into lava and other products of active volcanoes.

UPU'PIDÆ. The Hoopoe tribe; a family of the Insessores, or Perching birds, named from the *upupa*, or hoopoe, the last genus of Cuvier's *Tenuirostres*.

U'RAMIL. A crystalline substance obtained by treating a hot saturated solution of thionurate of ammonia with hydrochloric acid in excess. By decomposing this substance an acid is obtained, called the *uramilic*.

URANGLI'MMER. An ore of uranium, formerly called *green mica*, and by Werner *chalcolite*. See *Uranite*.

U'RANITE. The yellow uranite or *uran mica*, and the green uranite or *chalcolite*, are phosphates of oxide of uranium; they are distinguished by the former containing a small portion of phosphate of lime, and the latter an equivalent portion of phosphate of copper.

URANIUM. A metal discovered in 1781, in the mineral called, from its black colour, *pitch-blende*. It was named by Klaproth after the new planet Uranus, the discovery of which took place in the same year.

U'RANOCHRE. An ore of uranium, containing this metal in the oxidised state.

URANO'GRAPHY (οὐρανὸς, the heavens, γράφω, to describe). A subordinate department of the science of astronomy, presenting an account of the arrangements which have been made by astronomers for delineating the starry heavens, and working the many mathematical problems of which they are the subject.

U'RANUS or HERSCHEL. A planet discovered by Sir W. Herschel in 1781, March 13. Its apparent diameter is about 4″, from which it never varies much, owing to the smallness of our orbit in comparison of its own. Its real diameter is about 35,000 miles, and its bulk 80 times that of the earth. It is attended by satellites—two at least, probably five or six—whose orbits offer remarkable peculiarities.

URAO. A variety of sesqui-carbonate of soda, found in Columbia.

URATES. Compounds of uric or lithic acid with the salifiable bases.

U'RCEOLUS (dim. of *urceus*, a water pitcher). A small pitcher-like body, formed by the two bracts which, in the genus Carex, become confluent at their edges, and enclose the pistil.

U'REA. *Anormal cyanite of ammonia*. A substance existing in the form of lactate of urea in human urine, and combined with hippuric acid in that of the cow and elephant.

U'RETHANE. The name given by Dumas to a substance which he considered to be a combination of urea with carbonic ether. It is also considered as a chloroxicarbonic ether, in which the chlorine is replaced by amidogen.

URIC ACID (οὖρον, urine). *Lithic acid*. An acid existing in the urine of all carnivorous animals, and forming the basis of most urinary concretions. It forms, in combination with ammonia, the white part of the excrement of birds; and vast accumulations of that urate exist in the *guano*, or decomposed excrement of aquatic birds, by which many of the small islands on the Coast of Peru and Chili are covered, and which is used as a manure.

URILE. A compound radical, supposed to exist in uric acid and the products of its decomposition. It is a compound of 2 atoms of cyanogen and 4 atoms of carbonic oxide.

URN. The peculiar theca or capsule of mosses, containing the spores. It is placed at the apex of a stalk or *seta*, bearing on its summit a hood or *calyptra*, and closed by a lid or *operculum*.

URODELA. An order of Amphibious animals, including the Salamanders, Water-newts, &c., in which the gills disappear in the perfect state, but the tail is retained. They may be distinguished into the *Tritons*, which, like the frogs, exhibit aquatic habits even in the adult state; and the true *Salamanders*, which are more analogous to the toads in their appearance and habits.

URSA MAJOR. The Great Bear; a northern constellation, consisting of 87 stars, the principal of which is named Dubhe.

Ursa Minor. The Lesser Bear; a northern constellation, consisting of 24 stars, the principal of which is the Pole Star.

UR'SIDÆ (*ursus*, a bear). The Bear tribe of carnivorous vertebrate animals. These are the true plantigrade carnivora. Most of them possess several tuberculous teeth.

URTICA'CEÆ (*urtica*, a nettle). The Nettle tribe of Dicotyledonous plants. Trees or shrubs with *leaves* alternate; *flowers* apetalous, solitary, or clustered; *ovarium* superior 2-celled; *fruit*, a simple indehiscent nut.

U'TRICLE (*utriculus*, dim. of *uter*, a leathern bag). *Cystidium.* In Botany, a simple fruit, 1-celled, one or few-seeded, superior, membranous, frequently dehiscent by a transverse incision. It may be described as a caryopsis, the pericarp of which has no adhesion with the integuments of the seeds. It differs from the *pyxidium* in texture, being strictly simple, that is, not proceeding from an ovarium with obliterated dissepiments. It occurs in the amaranth, in chenopodium, &c.

V

VA'CUUM (*vacuus*, empty). Literally, an empty place, or *space* void of matter. This term generally denotes the space enclosed by a vessel from which the atmospheric air and every other gas has been excluded, as in the *Torricellian* vacuum above the surface of the mercury in the barometer tube, and the *Guerickian* or *Boylean* vacuum of the air-pump. The latter vacuum is always imperfect; the vessel is, nevertheless, called an *exhausted receiver*.

VAGA'NTES (*vagor*, to wander). A tribe of spiders comprising those which watch their prey from the web, and also frequently run with agility in pursuit of their prey.

VAGATRI'CES (*vagor*, to wander). Wanderers; an order of birds, which, being equally well adapted for walking and for flying, might be designated *terrestrial*. They walk with ease, leap under excitement, or even run with considerable speed. They include the corvine and the graculine birds.

VAGI'NA. Literally, a sheath; and hence applied, in Botany, to a leafy expansion surrounding the stem of some monocotyledonous plants; occasionally the petiole embraces the branch from which it springs, and in such case is said to be *sheathing*, and is even called a *sheath*, or *vagina*, as in grasses.

VA'GINATED (*vagina*, a sheath). A designation of those polyps which are enclosed in a calcareous sheath or tube, and are also called *tubiporidæ*.

VALERIANA'CEÆ. The Valerian tribe of Dicotyledonous plants. Herbs with *leaves* opposite; *flowers* corymbose, panicled, or in heads; *stamens* distinct; *ovarium* inferior 2-celled; *fruit* dry, indehiscent.

VALERIANIC ACID. *Valeric acid.* An acid obtained by distillation of the root of the *valeriana officinalis* with water, as long as it reddens litmus. Its salts are called *valerianates* and *valerates*.

VALLEY (*vallis*). A space lying between opposite ridges of mountains or of hills, its lowest part being commonly the bed of some torrent or river, which originates in the higher grounds. A level space of great breadth, separating two mountain-ranges, is not, properly speaking, a valley, but a plain. The same remark applies to "circular valleys," as that of Bohemia, 200 miles in diameter, and that of Cashmere, 90 miles in diameter, which are rather plains surrounded by mountains.

VALUE. Value is the only relation with which Political Economy is conversant; yet there is no subject as to the meaning of which economists are less agreed. Whately points out the inconsistencies of writers on this topic:—

1. "The popular, and far the most convenient, use of the word, is to signify the capacity of being given and received in exchange. So defined it expresses a relation. The value of any one thing must consist in the several quantities of all other things which can be obtained in exchange for it, and can never remain fixed for an instant. Most writers admit the propriety of this definition at the outset, but they scarcely ever adhere to it.

2. "Adam Smith defines Value to mean either the *utility* of a particular object, or the power of *purchasing other* goods which the possession of that object conveys. The first he calls 'Value in use,' the second 'Value in exchange.' But he soon afterwards says, that equal quantities of labour at all times and places are of equal value to the labourer, whatever may be the quantity of goods he receives in return for them; and that labour never varies in its own value. It is clear that he affixed, or thought he had affixed, some other meaning to the word; as the first of these propositions is contradictory, and the second false, whichever of his two definitions we adopt.

3. "Mr. Ricardo appears to set out by admitting Adam Smith's definition of Value in exchange. But in the greater part of his 'Principles of Political Economy,' he uses the word as synonymous with *Cost;* and by this one ambiguity has rendered his great work a long enigma.

4. "Mr. Malthus defines Value to be the power of purchasing. In the very next page he distinguishes absolute from relative value, a distinction contradictory to his definition of the term, as expressive of a *relation.*

5. "Mr. M'Culloch distinguishes between real and exchangeable, or relative, value. And in his nomenclature, the exchangeable, or relative, value of a com modity consists in its capacity of purchasing;—its real value in the quantity of labour required for its production or appropriation.

6. "All these differences appear to arise from a confusion of cause and effect. Having decided that commodities are valuable in proportion to the labour they have respectively cost, it was natural to call that labour their Value."

VALVE (*valvæ*, folding-doors). A close lid affixed to a tube or an opening in some vessel, by means of a hinge, and which can be opened only in one direction. Hence, the more forcibly it is pressed in the other direction, the closer it shuts the aperture, so that it either admits the entrance of a fluid and prevents its return, or admits its escape and prevents its re-entrance.

1. The *clack-valve*, or ordinary pump-valve, is of a circular form, and consists of a flat piece of leather rather larger than the aperture it is intended to close. It should open at an angle of 30°, so as to admit of a free passage, equal to its aperture. The *double-clack*, or *butterfly-valve*, consists of two semicircular valves, commonly employed for pump-buckets, and have the advantage of allowing less water to escape into the well or cistern while in the act of closing the orifice. Clack-valves consist sometimes of *four sectors of circles*, the angular points of which meet vertically over the centre of the orifice, the sides being disposed like those of a quadrangular pyramid.

2. The *conical* or *spindle valve* consists of a flat circular plate of metal, having its rim bevelled and ground so as to fit in a conical seat or nozzle. Its form is that of the frustum of a cone, the side of which makes an angle of 45° with a diameter of the base. It is usually employed as the *safety-valve* of the boiler of a steam-engine. The diameter of the valve-box should be to the greater diameter of the valve as 3 to 2; and the valve should not rise less than one-fourth of its greater diameter when quite open; but both these proportions must be increased if the valve be out of the centre of the box.

3. The *button-valve* or *puppet-clack* resembles the preceding valve, in being of a circular form, with a conical side, and having a vertical direction; this is effected by means of a guide-rod, which is

attached to the centre of the plate perpendicularly to its surface, and moves freely up and down in a perforation in each of two bars fixed diametrically across, and near the top and bottom of the orifice.

4. The *spherical valve* is a modification of the conical valve: the seat or nozzle represents a portion of a sphere; the valve itself may also be a portion of a sphere, or an entire sphere. It has been recommended as a *safety-valve,* to prevent the danger of adhering in the boilers of steam vessels. It is also called a *cup-valve.*

5. The *throttle-valve* has, instead of the reciprocating motion of the valves already noticed, a *rotary* motion. Its action is that of the flood-gate of a mill; its purpose is to regulate the power of a steam-engine, by increasing or diminishing the area of the steam-tube of a steam-engine, and thus to increase or diminish the amount of steam supplied to the cylinder. The name of this valve suggests its use: the steam-tube is *throttled* by it.

6. The *sliding valve* is one which does not rise from, and fall into, a seat or nozzle, but slides on and off its aperture; hence, it is commonly called a *slide.* In modern steam-engines, the steam-passages are opened and closed by the action of a *single slide, which performs the office of four valves.* To this head belong the slides of Seaward, Murray, Murdock, &c. The last of these, from its semi-cylindrical form, is commonly called the D-*slide.*

7. The *single cock* is a kind of valve consisting of a plug of a nearly cylindrical shape, inserted into a hole of corresponding form and dimensions in a tube; the plug is perforated by a large hole, and turned by a handle outside the tube. The *four-passaged cock* is a contrivance, founded on the principle of the common cock, for putting *four passages* into communication with each other, alternately by pairs; it is used in steam-engines for establishing communications between the boiler, two cylinders, and the external air. Instead of this apparatus, two *doubled-passaged* cocks may be employed: the four-passaged becomes a double-passaged cock by obliteration of one of the passages.

VALVES (in Botany). 1. A term applied to the parts into which certain fruits separate, exhibiting the various forms of *valvular* dehiscence—the septicidal, the loculicidal, and the septifragal; the axis of the fruit from which the valves separate in cases where a distinct axis exists, is called the *columella.* 2. The term *valve* has been also applied collectively to the three classes of bracts of which the flower of grasses is composed. 3. It also denotes the opening in the cells of anthers, which occurs when the pollen is about to be discharged.

VALVES (in Zoology). The term *valves* denotes the two ordinary or principal pieces which form the covering of the acephalous testacea, or bivalves.

VANA'DIUM (*Vanadis,* a Scandinavian deity). A rare metal discovered by Sefstrœm in 1830, in the iron prepared from the iron ore of Taberg, in Sweden, and procured afterwards in larger quantity from the slag of that ore. It was subsequently discovered in a new mineral, the vanadiate of lead. It occurs in the state of *vanadic acid.*

VANISHING QUANTITY. In Mathematics, a quantity is said to *vanish,* or to become *evanescent,* when its arithmetical value is nothing, or denoted by 0. See *Fraction.*

VAPORIZA'TION. The conversion of a liquid or of a solid body into vapour by the application of heat. It comprises the phenomena of evaporation and of ebullition. When solid bodies are vaporized and subsequently condensed, the operation is termed *sublimation,* and it is employed for the purification of certain substances, and for other purposes.

VAPOUR. A light, expansible, and generally invisible gas, resembling air completely in its mechanical properties, while it exists, but subject to be condensed into the liquid or the solid form by cold. Vaporizable bodies are termed *volatile;* while those which resist the heat of the furnace without undergoing vaporization, are said to be *fixed* in the fire.

Vapour, atmospheric. The watery vapour existing in the atmosphere from contact with the surface of the sea, of lakes, of rivers, and of humid soil. Its quantity is limited by temperature, and when this is reduced, the watery vapour is condensed, and becomes visible in the form of dew, clouds, rain, &c. Vapour, when visible, is termed *vesicular,* from its appearing, in that state, in the form of minute vesicles.

VARA'NIDÆ (*Varanus,* the monitor). The Monitors; a family of Lizards, known as the *Platynote* or *Broad-backed*

Saurians, arranged by Linnæus under the great genus *Lacerta*.

VAREC. The French name for *kelp*, or incinerated sea-weed.

VARIABLE MOTION. In Mechanics, a *variable motion* is that which is produced by the action of a force which varies in intensity, or which continues to act after motion has been communicated to it.

VARIABLE QUANTITY. In Mathematics, a quantity is called *variable*, which continually increases or decreases, as distinguished from a *constant* quantity, which remains always the same. Thus, the abscissas and the ordinates of an ellipsis, or other curve line, are variable quantities, because they vary or change their magnitudes together. The diameter of a circle and the parameter of a conic section are constant, while their abscissas are variable. Variable quantities are usually denoted by the last letters of the alphabet, x, y, z, while the constant are denoted by the first a, b, c.

VARIABLE STARS. Stars which undergo a *periodical* increase and diminution of their lustre. The star called Algol, or β Persei, is usually visible as a star of the second magnitude, and such it continues for the space of 2d. 14h., when it suddenly begins to diminish in splendour, and in about 3½ hours is reduced to the fourth magnitude. It then begins again to increase, and in 3½ hours more is restored to its usual brightness, going through all its changes in 2d. 20h. 48m., or thereabouts. This remarkable law of variation suggests the revolution round it of some opaque body, which, when interposed between us and Algol, cuts off a large portion of its light. *Herschel.*

VARIATION. An algebraical rule for investigating the relation which varying and dependent quantities bear to each other. When one quantity y depends upon another x, in such a manner that if x is changed in value, the value of y is changed in the same proportion, then y is said to *vary directly* as x, or, shortly, to *vary* as x. Variation is merely an abridgment of Proportion; for one quantity is said to "vary" as another, not because the two increase and decrease together, but because as one increases or decreases, the other increases or decreases *in the same proportion*. The sign used to denote variation is $\propto$ (read *varies as*). Thus, $x^2 + 3x \propto 2x^2 + 6x$, since $\frac{x^2 + 3x}{2x^2 + 6x} = \frac{1}{2}$, whatever be the value of x. Single and Double Rule of Three sums are solved upon the principles of Variation and Proportion.

1. One quantity is said to *vary directly* as another, when the two quantities depend wholly upon each other, and in such a manner, that, if one be changed, the other is changed *in the same proportion*. If the altitude of a triangle be invariable, the area varies as the base.

2. One quantity is said to *vary inversely* as another, when the former cannot be changed in any manner, but the reciprocal of the latter is changed *in the same proportion*. If the area of a triangle be given, the base varies inversely as the perpendicular altitude.

3. One quantity is said to *vary as two others jointly*, if, when the former is changed in any manner, the product of the other two be changed *in the same proportion*. The area of a triangle varies as its base and perpendicular altitude jointly.

4. One quantity is said to *vary directly* as a second and *inversely* as a third, when the first cannot be changed in any manner, but the second multiplied by the reciprocal of the third is changed *in the same proportion*. The base of a triangle varies as the area directly and the perpendicular altitude inversely.

VARIATION OF THE COMPASS. This term, as well as the expressions, "variation of the needle" and "declination of the needle," denotes the angle which a vertical plane passing through the axis of a magnetized needle makes with the geographical meridian of a ship or station; and as, for the purposes of navigation, the needle is made to traverse horizontally, the variation becomes the angle between the magnetic axis of the needle and a meridian line passing parallel to the horizon through the centre of the compass.

VARIATION OF CURVATURE. The change of curvature which takes place in passing from one point of a curve to another. In the conic sections, the variation of curvature at any point is proportional to the tangent of the angle included between the diameter and the normal, both of these passing through that point. The circle is the only curve in which the curvature is uniform at every point.

VARIATIONS, BAROMETRICAL. The changes in the altitude of the barometer at the same place are in part *regular*, and in part extremely *irregular*.

The regular variations occur almost always at the same time of day, attaining daily two *minima* and two *maxima*. They show that an ebb and a flow take place in the atmosphere, similar to what is observed in the sea. These are very small, the oscillation seldom amounting to more than a line, and are, for the most part, observable only in the torrid zone. The irregular changes are much greater in degree than the regular, and are more frequent and observable as we approach the poles; for this reason less notice is paid by us to the regular alterations in the height of the mercury.

VARIATIONS, CALCULUS OF. "When a quantity is subject to one sort of variation only, the consideration of that variation belongs to the simple *differential calculus;* but when it is subject to two or more distinct sorts of variation, suppose that of the differential calculus and another, then the mode of dealing with the second sort of variation is said to belong to the *calculus of variations.*"

Illustration. "In Dynamics, for example, there are two distinct species of motion to consider: one which, at the end of the time t, the system is about to take during the ensuing time dt in consequence of the velocities acquired by its particles; and another which, without any consideration of the first, must be impressed upon it for the examination of the conditions which express the equivalence of the impressed and effective forces. Here then is a case for the calculus of variations."—*Pen. Cycl.*

VARIATIONS, PERIODIC and SECULAR. In the language of Astronomy, the term *variation* denotes a change of inclination of the orbit of a planet occasioned by a disturbing body. When these changes are compensated by the configurations of the disturbed and the disturbing body with each other, and therefore in comparatively short periods, they are called *periodic variations;* and the deviations, thus compensated, are called *inequalities depending on configurations.* When the compensation is operated by a period of the node, it has nothing to do with the configurations of the bodies, but requires an immense period of time for its consummation, and is, therefore, distinguished from the former by the term *secular variation.*

The *variation of the moon* is an inequality of the moon's motion, depending on the angular distance of this body from the sun. It arises from that part of the sun's disturbing force which is at right angles to the radius vector, and which *accelerates* the motion of the moon from the quadratures to the syzygies, and *retards* it from the syzygies to the quadratures.

VARIEGATION IN PLANTS. A general term denoting the arrangement of two or more colours in the leaves, petals, and other parts of plants. These parts are said to be *marbled*, when a surface is traversed by irregular veins of colour, like a block of marble; *discoidal*, when there is a single large spot of colour in the centre of some other colour; *ocellated*, when a broad spot of some colour has another spot of a different colour within it, like a little eye; *tessellated*, when the colours are disposed in small squares, like those of a tessellated pavement; *lettered*, when the spots of colour present the form and appearance of letters. Other terms are employed of more common use, and requiring no explanation, as *striped*, *dotted*, *banded*, &c.

VARIETIES. In Botany, *varieties* of plants are individuals subordinate to *species*. The variety differs from the species in points of structure which are developed only under particular circumstances, and which are not essential to the species. The characters on which a *species* is founded should be invariable under all circumstances; the characters of a *variety* are induced by local situation, by atmospheric influence, by cultivation, &c.; with all the characters of the species, the variety may differ in a change of colour, an increased number of petals, &c. Varieties may be subdivided, with reference to other non-essential points, constituting *sub-varieties*. The term variety is similarly employed in Zoology.

VA'RIOLITE. A porphyritic rock consisting of an imperfectly crystallized aggregate of felspar and quartz.

VARIX. A swollen vein; a term employed in Malacology to denote the strong elevated ridges which cross the whorls of several of the predaceous genera, as murex, triton, &c.; they mark the progressive enlargement of the shell, being the remnants of former apertures, beyond which the animal, when grown, forms another aperture.

VARNISH. A substance made by dissolving resins in alcohol, or oil of turpentine, or in a mixture of oil of turpentine and a drying oil. There are alcoholic or spirit varnishes, volatile-oil varnishes, and fixed-oil varnishes. *Lacker*, or *lacquer*, is a lac varnish consisting of a solution of shell-lac in alcohol, and applied to articles of brass, &c.

VARNISH-TREES. A technical name applied to trees which exude liquid resins, naturally or in consequence of incisions.

VAR'VICITE. An ore of manganese, occurring massive at Hartshill, in Warwickshire, and in pseudo-crystals at Ilfeld.

VASCULAR PLANTS (*vasculum*, a little vessel). A term applied to the two great divisions of plants called Exogens and Endogens, owing to the high development of *vascular tissue* in these plants, and in order to distinguish them from Cellular or Cryptogamic plants, in which the tissue is principally cellular.

VASCULAR TISSUE (*vasculum*, a little vessel). *Trachenchyma.* A tissue in plants, consisting of simple membranous tubes tapering to each end, but often ending abruptly, either having a fibre generated spirally in the inside, or having their walls marked by transverse bars arranged more or less in a spiral direction. There are two principal kinds of vascular tissue, viz. *spiral vessels* or *tracheæ*, and *ducts :* the former present the continuous spiral fibre, and are capable of unrolling with elasticity; the latter present transverse lines, rings, or bars, and are incapable of unrolling without breaking.

VAU'QUELINITE. Chromate of lead and copper; one of the ores containing chromium, occurring massive, and in minute crystals on quartz, accompanying the chromate of lead, in Siberia.

VECTOR (*veho*, to carry). The carrier; a term applied, in Geometry, to a *radius*, which is *carried* round a centre; any given point on such a radius describes a curve (See *Radius Vector*). In Astronomy, a straight line drawn from the centre of a planet to the centre of the sun becomes a radius vector, and the planet appears to be *carried* by it in its orbit round the sun. In a conic section, the radius vector is a straight line drawn from one of the foci to any point in the curve.

VEDA (*vid*, Sansc to know). A term signifying the sum of all knowledge; or, according to another derivation, self-evident knowledge or revelation. The word is, however, particularly applied to the four principal sacred books of the Hindus, viz. the RY'ch, the Yajush, the Sâman, and the Atharvan'a.

VEERING (*virer*, French). *Wearing.* A nautical term for that movement of a ship by which, when sailing with the wind on either bow, she is brought, by turning her head to leeward, into a contrary position, so as to present the other bow to the wind, by which means her course is reversed.

VEGA. A star of the first magnitude in the northern constellation Lyra.

VEGETABLE ÆTHIOPS. A charcoal prepared by incinerating the *fucus vesiculosus* in a covered crucible.

VEGETABLE IVORY. A substance sometimes whiter and harder than ivory, consisting of the seed of a genus of plants called *Phytelephas*, belonging to the natural order Pandanaceæ. It is commonly called tagua plant; and in Peru, celebra de negro, or negro's head. It is extensively used for the same purposes as ivory, but does not retain its colour so well.

VEGETABLE KINGDOM. In addition to what has been written under the article *Botany*, a sketch is here subjoined of the connexion subsisting between the three great kingdoms, or divisions of natural bodies. These are represented each as starting from a common point; and the further any group of beings is from this point, the more are they unlike the others.

ORGANIC MATTER.

Vegetable Kingdom.	*Animal Kingdom.*
Exogenæ.	Vertebrata.
Gymnospermæ.	Mollusca.
Endogenæ.	Articulata.
Rhizanthæ.	Radiata.
Acrogenæ.	Acrita.

Indeterminate Substances.
Organic Elements.
Gases, Water.
Metallic Oxides.
Metals.
Mineral Kingdom.

INORGANIC MATTER.

VEGETABLE SOIL. The thin external crust of the earth in which plants grow, composed of fragments of minerals, vegetables, and animals, reduced to a great degree of tenuity.

VEGETABLE SULPHUR. *Witchmeal.* A powder procured from the theca of the *lycopodium clavatum*, or common club-moss. It is highly inflammable, and is used for pyrotechnical purposes.

VEGETABLE WAX. A wax-like substance procured from several species of *Myrica*, one species of which (*gale*), from the uses to which this substance has been devoted, has been named the Tallow-shrub or Candleberry-tree. The wax is found, in some cases, on the berries, in others on the cones or catkins. Another remarkable plant of this kind is the *Ceroxylon andicola*, a Wax Palm of the American Spaniards.

VEGETATION, SALINE. A kind of crystalline film which shoots up spontaneously from the edges of a solution of crystallizable matter, as salt, camphor, &c.

VEGETO-ALKALIES. *Alkaloids.* A class of bodies obtained from the vegetable kingdom, containing nitrogen, having the properties of the basic or metallic oxides, and forming salts with acids. Of this class are quinine, strychnine, veratrine, &c.

VEGETO-SULPHURIC ACID. An acid procured by treating ligneous fibre with sulphuric acid.

VEINS, MINERAL. Cracks or fissures in rocks filled up by substances different from the rock, which may be either earthy or metallic. Veins are sometimes many yards wide; and they ramify or branch off into innumerable smaller parts, often as slender as threads, like the veins of an animal. Inconsiderable veins, which diverge from the principal, are called *slips;* and those masses of ore which are of considerable magnitude, but of no great length, are called *bellies*, or *stockworks.*

M. Carne characterizes eight successive groups of *veins and slides in Cornwall.* The oldest are tin veins (lodes), underlying (dipping) to the north, ranging nearly E. and W. by compass. The second class consists of tin veins, underlying to the south, ranging E. and W. nearly (by compass). The third includes east and west copper veins. The fourth are diagonal (or contra) veins, ranging N.W. and S.E., and yield copper. The fifth includes *cross courses*, ranging N.NW. and S.SE., and rarely yielding metal, except lead. A sixth group includes 'cross flukans' (clay veins), ranging nearly N. and S. An eighth includes 'the slides,' which are formed of soft clay, and cut through all the others.

VEINS OF PLANTS. The ramifications of the petiole among the cellular tissue of the leaf are called *veins*, and the manner of their distribution is termed *venation.*

1. The principal vein, or that which forms a continuation of the petiole and the axis of the leaf, is called the *midrib* or *costa;* if other veins similar to the midrib pass from the base to the apex of the leaf, such veins have been called, though incorrectly, *nerves*, and a leaf with such a distribution of veins has been called a *nerved* leaf.

2. A leaf is said to be *three*, or *five*, or otherwise *nerved*, if the so-called nerves all proceed from the base of the lamina; it is also said to be *triple*, *quintuple*, &c. *nerved.* If the veins diverge from the midrib towards the margin, ramifying as they proceed, such a leaf is called a *venous* or *reticulated* leaf.

3. Dr. Lindley adopts the following terms:—1. The largest veins given off from the midrib on each side, are the *primary veins*; each of these forms a curve, and anastomoses with the back of the next primary; the curved portion being called the *curved vein.* 2. Between the curved vein and the margin, other veins, proceeding from the curved veins, with the same curved direction, and of the same magnitude, occasionally intervene: these may be distinguished as *external veins.* 3. The margin itself and these last are connected by a fine network of minute veins, which may be called *marginal veinlets.* 4. From the midrib are generally produced, at right angles with it, and alternate with the primary veins, smaller veins, which may be called *costal veins.* 5. The primary veins are themselves connected by fine veins, which anastomose in the area between them; these veins, when they immediately leave the primary veins, are *proper veinlets*, and, where they anastomose, *common veinlets.* 6. The area of parenchyma, lying between two or more veins or veinlets, is called *intervenium.*

VELO'CITY (*velox*, quick). The *velocity* of a body is the *rate* of its motion, or the degree of quickness with which it is moving. The velocity of a body is *uniform*, when it moves through equal spaces in equal times, and it is then measured by the space described in a certain unit of time, as a second; when the velocity is *variable*, it is measured by the space which would be described in the said time if the motion were continued uniform for that time.

1. *Velocity, absolute and relative.* The

velocity of a body is called *absolute*, if we consider its motion in space, without any reference to that of other bodies. It is termed *relative*, when compared with that of another body which is itself in motion. If two carriages go along the same road in the same direction, their *relative* velocities will be the difference of their *absolute* velocities; if in opposite directions, the same. See *Motion*.

2. *Velocities, parallelogram of*. A proposition very nearly analogous to the 'parallelogram of forces,' employed for finding the resultant of two velocities. Thus, "if two velocities, with which a particle is simultaneously animated, be represented in direction and magnitude by two straight lines drawn from the particle, the resultant velocity of the particle will be represented in direction and magnitude by the diagonal of the parallelogram described upon those two straight lines."

3. *Velocity, resolution of*. It follows from the proposition just stated, that, if a particle be moving with a velocity v in a direction making an angle θ with a given line, we may conceive the particle to be animated by two velocities, $v \cos \theta$ in the direction parallel to the given line, and $v \sin \theta$ in the direction perpendicular to it. This is called *resolving* a velocity.

VELUM. Literally, a *veil;* hence applied to a horizontal membrane connecting the margin of the pileus of a fungus with the stipes. When it is adnate with the surface of the pileus, it is a *velum universale;* when it extends only from the margin of the pileus to the stipes, it is a *velum partiale*.

VENATION OF LEAVES. A term denoting the manner in which the *veins* are distributed among the cellular tissue of the leaf. Writers differ much on this point of nomenclature: the following arrangement is taken from Dr. Lindley's "Introduction to Botany." Leaves are called,—

1. *Veinless*, when no veins at all are formed, except a slight approach to a midrib, as in mosses, fuci, &c., and the lowest tribes of foliaceous plants. Under this head, De Candolle has his *folia nullinervia*, in which there is not even a trace of a midrib, as in ulva; and *folia falsinervia*, in which a trace of a midrib is perceptible.

2. *Equal-veined*, when the midrib is perfectly formed, and the veins are all of equal size, as in ferns. These are intermediate between those without veins and those in which "primary" veins are first apparent. The veins are equal in power to the "proper veinlets" of leaves of a higher class. See *Veins of plants*.

3. *Straight-veined*, when the veins are entirely primary, generally very much attenuated, and arising from towards the base of the midrib, with which they lie nearly parallel; they are connected by "proper veinlets;" but there are no "common veinlets." The leaves of grasses and of palms and orchidaceous plants are of this nature.

4. *Curve-veined*, a modification of the last form, in which the primary veins are also parallel, simple, and connected by unbranched "proper veinlets;" do not pass from near the base to the apex of the leaf, but diverge from the midrib along its whole length, and lose themselves in the margin. It is common in Zingiberaceæ. The straight-veined and curve-veined leaves are referred by De Candolle to modifications of the petiole.

5. *Netted*, when all the veins of a completely developed leaf are present, arranged as described under the article *Veins of plants*, without any peculiar combination of any class of veins. This is the common form of the leaves of dicotyledons, as of the lilac, the rose, &c. This is the *folium retinervium* of De Candolle.

6. *Ribbed*, when three or more midribs proceed from the base to the apex of the leaf, and are connected by branching primary veins of the form and magnitude of proper veinlets, as in melastoma. This must not be confounded with the *straight-veined* leaf, from which it may in all cases of doubt be distinguished by the ramified veins which connect the ribs. If a ribbed leaf has three ribs springing from the base, it is said to be *three-ribbed;* if five, *five-ribbed;* and so on. But if the ribs do not proceed exactly from the base, but from a little above it, the leaf is then said to be *triple-ribbed*, as in helianthus.

7. *Falsely ribbed*, when the "curved" and "external veins," both or either, in a netted leaf, become confluent into a line parallel with the margin, as in all myrtaceous plants. This has not been before distinguished.

8. *Radiating*, when several ribs radiate from the base of a netted leaf to its circumference, as in lobed leaves. To this head are referred the *pedalinerved, palminerved*, and *peltinerved* leaves of De Candolle; the differences of which do not

arise out of any peculiarity in the venation, but from the particular form of the leaves themselves.

9. *Feather-veined*, in which the primary veins of a netted leaf pass in a right line from the midrib to the margin, as in castanea. This has the same relation to the radiating leaf as the curve-veined bears to the straight-veined. It is the *folium penninervium* of De Candolle.

10. *Hidden-veined*, when the veins are hidden from view by the parenchyma being in excess, as in hoya. Such a leaf is often inaccurately called veinless. De Candolle calls a leaf of this nature, in which the veins are dispersed through a large mass of parenchyma, as in mesembryanthemum, *folium vaginervium.*

11. The direction which the primary veins take when they diverge from the midrib, can be denoted by measuring the angle formed by the midrib and the diverging vein, and can be stated either in distinct words or by applying the following terms: — thus, if the angle formed by the divergence is between 10° and 20°, the vein may be said to be *nearly parallel* (*subparallela*); if between 20° and 40°, *diverging;* between 40° and 60°, *spreading;* between 60° and 80°, *divaricating;* between 80° and 90° *right-angled;* between 90° and 120°, *oblique;* beyond 120°, *reflexed* (*retroflexa*).

VENE'RIDÆ. A family of macrotrachian bivalves, named from the genus *Venus*, and characterized by the moderate length of the two siphons, which are sometimes united.

VENT-PEG. The pressure of the atmosphere, transmitted as it is in all directions with a weight of about fifteen pounds on the square inch, prevents the flow of liquids from a small aperture of a vessel, unless the pressure be admitted to the surface of the liquid. The *vent-peg* is, therefore, raised in order to admit the air to the surface of a liquid which is to be drawn off from a closed vessel.

VENTRAL (*venter*, the belly). A term applied, in Botany, to that *suture* of the legume to which the seeds are attached, the opposite being called the *dorsal* suture.

VENTRICOSE (*venter*, the belly). Bellying; swelling unequally on one side; as the corolla of many labiate and personate plants.

VENTRI'CULITES. A genus of spongoid zoophytes found in the cretaceous system, having their porous tissue penetrated by distinct ventricles or foramina, sometimes of large dimensions, and with a certain degree of regularity.

VENUS. The most beautiful of all the stars. Her mean distance from the sun is seventy millions of miles; her apparent diameter varies from 30″ to 184″. Her rotation on her axis takes place in 23d. 21′ 19″, and the period of her revolution round the sun is 224d. 16h 49′. When Venus is in that part of her orbit which gives her the appearance of being west of the sun, she rises before him, and is then called the *morning* star; and when she appears east of the sun, she is behind him in her course, and is then called the *evening star.*

VERA'S CORD-PUMP. An endless cord, running round two wheels, descends below the surface of the water, which it raises by means of the adhesion subsisting between the liquid and the cord, to which a rapid motion is imparted by the upper wheel. On this effect of adhesion depend writing with ink, colour drawing, the smearing of metals, especially iron, with oil or grease, to protect them from rust.

VERA'TRIC ACID. An acid with which the alkali *veratria* is combined in cebadilla, the seed of the *helonias officinalis.*

VERB (*verbum*, a word). That part of speech which expresses the *action* or *being* of a thing, and which is usually the principal *word* of a sentence. A verb is called *active-transitive*, when it expresses an action exerted upon some object; *active-intransitive*, when its action is not communicated to any object; *passive*, when it represents its subject or nominative as being acted upon; *neuter*, when it expresses a state of existence without action or passion.

Verbs, auxiliary. Verbs which, though they originally expressed motions of action, only express *relations of action* when considered as auxiliary verbs, and are accordingly employed, in connexion with other verbs, to give them certain relations called by grammarians *tense*, *mood*, and *voice.*

VERBAL and REAL QUESTIONS. "Sometimes the Question turns on the meaning and extent of the *terms* employed; sometimes, on the *things* signified by them. If it be made to appear, therefore, that the opposite sides of a certain Question may be held by persons not differing in their *opinion of the matter* in hand, then that *Question* may be pronounced *Verbal;* as depending on the different senses in which they respectively employ the *terms*. If, on the contrary, it appears that they employ the terms in the same sense, but still differ as to the application of one of them to the other, then it may be pronounced that the *Question* is *Real;*—that they differ as to the opinions they hold of the *things* in Question." —*Whately*.

VERBENA'CEÆ. The Verbena or Vervain tribe of dicotyledonous plants. Trees or shrubs, sometimes herbs, with *leaves* opposite; *calyx* tubular; *corolla* irregular; *stamens* didynamous, occasionally 2; *fruit* consisting of 2 or 4 nucules in a state of adhesion; *seeds* exalbuminous.

VERD ANTIQUE. A beautiful mottled green marble, an aggregate of marble and serpentine.

VERDIC ACID. An acid obtained from the root of the *scabiosa succisa* and other plants, and named from its property of becoming green on exposure to the air, owing to the absorption of oxygen.

VE'RDIGRIS (*verde-gris*). A subacetate of copper, formed by placing plates of the metal in contact with the fermenting marc of the grape, or with cloth dipped in vinegar. The green salt is found in commerce under the improper name of *distilled verdigris*. A spurious kind is sold under the name of *English verdigris*, consisting of sulphate of copper and acetate of lead.

VE'RDITER. A blue pigment, procured by adding chalk or whiting to a solution of copper in aquafortis.

VERJUICE (*verjus*, Fr.). A kind of harsh vinegar, made of the expressed juice of the wild apple or crab, which has undergone the vinous fermentation. The French give this name to unripe grapes, and to the sour liquor obtained from them.

VERMI'CULITE. A silicate of magnesia and iron, described as composed of micaceous-looking plates cemented together by a whitish matter.

VERMILION. A red pigment, consisting of powdered cinnabar, or the red sulphuret of mercury. This substance, if heated till sulphur begins to sublime from it, and then suddenly thrown into cold water, becomes black; although, if allowed to cool slowly, it remains red. Yet it is of the same composition exactly in the black and red states.

VERNAL EQUINOX. The time when the sun enters the first point of *Aries*, or the ascending point of the ecliptic, is the vernal equinox to those who live in the northern hemisphere, while the first point of *Libra* is the same to those in the southern.

VERNA'TION (*vernus*, belonging to the Spring). *Gemmation*. A botanical term denoting the manner in which the leaves of plants are arranged in the unexpanded or bud state. The ideas expressing these modifications are essentially the same as those applied to the parts of the flower in the same state, to which the term *Æstivation* on *Præfloration* is devoted. The Vernation or Æstivation of plants is said to be,—

1. *Involute*, when the edges of the leaves are rolled inwards spirally on each side, as the leaf of the apple.

2. *Revolute*, when the edges are rolled backwards spirally on each side, as the leaf of rosemary; or, in other words, when two conduplicate leaves clasp each other.

3. *Obvolute*, when the margins of one leaf alternately overlap those of the leaf which is opposite to it.

4. *Convolute*, when one leaf is wholly rolled up in another, as the petals of wallflower.

5. *Supervolute*, when one edge is rolled inwards, and is enveloped by the opposite edge rolled in an opposite direction, as the leaves of apricot.

6. *Induplicate*, when the margins are bent abruptly inwards, and the external face of these edges are applied to each other without any twisting, as in the flowers of some species of clematis.

7. *Conduplicate*, when the sides are applied parallelly to the faces of each other, as in the leaves of the cherry.

8. *Plaited*, when the leaves are folded lengthwise, like the plaits of a closed fan, as in the vine and many palms.

9. *Replicate*, when the upper part of the leaf is curved back and applied to the lower, as in aconite.

10. *Curvative*, when the margins are slightly curved, either backwards or forwards, without any sensible twisting.

11. *Wrinkled*, when the parts are folded up irregularly in every direction, as the petals of the poppy.

12. *Imbricated*, when the parts overlap one another parallelly at the margins, without any involution.

13. *Equitant*, where the parts overlap each other parallelly and entirely, without any revolution, as the leaves of iris.

14. *Reclinate*, when the parts are bent down upon their stalk.

15. *Circinate*, when the parts are rolled spirally downwards, as the fronds of ferns.

16. *Valvate*, when the parts are applied to each other by the margins only, as the petals of umbelliferous plants, the valves of a capsule, &c.

17. *Quincuncial*, when the parts are five in number, of which two are exterior, two interior, while the fifth covers the interior with one margin, and has its other margin covered by the exterior, as in the rose.

18. *Contorted*, when each part is oblique in figure, and overlaps its neighbour by one margin, its other margin being, in like manner, overlapped by that which stands next to it, as in apocynaceæ.

19. *Twisted*, the same as contorted, except that there is no obliquity in the form or insertion of the pieces, as in the petals of oxalis.

20. *Alternative*, when, the pieces being in two rows, the inner is covered by the outer in such a way that each of the exterior rows overlaps half of two of the interior, as in liliaceous plants.

21. *Vexillary*, when one piece is much larger than the others, and is folded over them, they being arranged face to face, as in papilionaceous flowers. See *Vexillum*.

22. *Cochlear*, when one piece, being larger than the others, and hollowed out like a helmet or bowl, covers all the others, as in aconite, some species of personate plants, &c.

VERNIER. A small moveable scale, running parallel with the fixed scale of a quadrant or other instrument, and having the effect of subdividing the divisions of that instrument into more minute parts. Its name is derived from that of its inventor. See *Nonius*.

Vernier, chromatic. An instrument invented and so named by Dr. Brewster, and employed for measuring, by comparison, very minute variations of tints.

VERRU'CÆ (*verruca*, a wart). Warts, or *sessile glands*, produced upon various parts of plants, and extremely variable in figure. They are the *cellular glands* of Mirbel. As they occur on the skin of the seed, they are the *seminal spongioles* of De Candolle.

VE'RSATILE (*versatilis*, that turns easily). Oscillating; adhering slightly by the middle, so that the two halves are nearly balanced, and swing backwards and forwards; a term applied to the *anthers* of plants, when they are attached to the filament by a single point of the connective, as in all true grasses.

VERSED AND SUVERSED SINE. The *versed sine* of an arc is that portion of the radius intercepted between the sine and the extremity of the arc. The *suversed*, or *supplemental versed*, *sine* is the difference between the versed sine and the diameter.

Etymology. "The term *sine* (the Latin word *sinus* meaning the bosom) has been the object of much discussion. It was at one time looked on as a barbarism from the Arabic; and some endeavoured to substitute *semissis inscriptæ*, the half of the chord, for it. Others again thought that it was a corruption of *S. Ins.*, the abbreviation of the above. Dr. Hutton asserts that the Arabic word *jeib*, which is used for the trigonometrical sine in that language, also means the bosom in common language; and we have been told that this is correct: if so, the Latin *sinus* is only the literal translation of the Arabic. The arc representing a bow (from which it gets its name), half of the string, which represents the sine of half the arc, would come against the breast of the archer. The versed sine (*sinus versus*, or turned sine) was called the *sagitta*, or arrow."—*Pen. Cycl.*

VERTEBRA'TA (*vertebra*, a joint of the back-bone). A large division of the Animal Kingdom, including all those species which are furnished with a backbone, or vertebral column, as the mammalia, birds, reptiles, and fishes. These are the *Myelencephala* of Owen, the *Spinicerebrata* of Grant.

VERTEX. Literally, the *top* or summit of any figure. In Astronomy, it denotes that point in the heavens which is directly over our heads, called the *zenith*. In Geometry, it is the apex, or upper point, of a triangle. In conic sections, it is the point through which the generating line of the conical surface always passes. The vertex of a curve is the point in which the diameter meets the curve.

VERTICAL (*vertex*, the top). Perpendicular; being at right angles to any body. A *vertical circle*, in Astronomy, is a great circle perpendicular to the horizon, and passing through the zenith and nadir of any place. A *vertical line* has the same meaning. A *vertical plane*, in conics, denotes a plane passing through the vertex, and parallel to the plane of the section.

VERTICAL CIRCLES. This name is applied, in Nautical Astronomy, to great circles drawn on the hollow sphere, passing through the zenith of any place. That particular vertical circle which passes through the east and west points, is called the *prime* vertical; the angle contained between a vertical circle passing through a heavenly body and the celestial meridian opposite to a place, is called its *azimuth*.

VERTICILLA'STER (*verticillus*, a whorl). A botanical term applied by Hoffmansegg to the *cyme* when reduced to a very few flowers. It constitutes the normal form of inflorescence of the Labiatæ, or Mint tribe, in which two *verticillastri* are situated opposite to each other in the axils of opposite leaves. By Linnæus, the union of two such verticillastri was called a *verticillus*, or whorl; and by others, with more accuracy, a *verticillus spurius*, or false whorl. By Link, this form of inflorescence is called a *thyrsula*.

VERTICI'LLUS (*verto*, to turn). Literally, a little whern, a whorl, an axis, or spindle. This term is applied, in Botany, to that arrangement of leaves upon the stem, in which more than two of them are opposite to one another, or are on the same plane, as in Galium. The natural order Galiaceæ has, in fact, been named *Stellatæ*, from the stellate or *whorled* arrangement of the leaves.

VESICLE (*vesicula*, dim. of *vesica*, a bladder). A small, circular, inclosed space, like that contained by a little bladder. Hence, the term *vesicular tissue* is applied to one of the elementary tissues of plants, generally consisting of little bladders or vesicles of various figures, adhering together in masses. This is also called *cellular* and *utricular* tissue.

VESICULA AMNIOS. *Vesicula colliquamenti*. The name given by Malpighi to the *quintine*, or fifth integument occasionally found in the ovule of plants. This is called by other writers, *sac of the embryo*, *additional membrane*, &c. A very delicate thread, called the *suspensor*, descends from the summit of the ovule into the quintine, and bears at its extremity a globule which is the nascent embryo.

VESPERTILIO'NIDÆ. The Bat tribe; a family of insectivorous Cheiropterans, characterized by peculiarities of the nasal appendages. In the *Rhinolophinæ*, or Horse-shoe bats, the nasal appendages are complicated and membranaceous; in the *Phyllostominæ*, or true Leaf-nosed bats, the appendage is simple, fleshy, solitary or double; in the *Pteropinæ*, or Simple-nosed bats, in the *Noctilioninæ*, or Bull-dog bats, and in the *Vespertilioninæ*, or True bats, there is no nasal appendage at all.

VE'SPIDÆ (*vespa*, a wasp). The Wasp tribe; a family of hymenopterous insects, distinguished from all other species of the order by having their wings folded, when at rest, through their entire length.

VESSELS, MILK, AND TURPENTINE. *Vasa propria*. These names were given by Grew to certain cavities in plants, formed by expansion of the simple "intercellular spaces," and filled with the peculiar juices of the plant, as with milk in the poppy, with turpentine in terebinthus, &c. These are the *accidental reservoirs* and the *cæcal reservoirs* of De Candolle. See *Vittæ*.

VESSELS, STRANGULATED. *Vasa moniliformia*, vel *vermiformia*. A variety of vessels found in plants, characterized by a moniliform, or necklace-like, appearance, occasioned by irregular compression, or strangulation, when growing in knots or parts which are subject to an interrupted mode of development. By the French, these vessels are termed *vaisseaux en chapelet* or *étranglés*. They are considered to be young spiral vessels, which, instead of lengthening, grow together by their ends.

VESSELS, VITAL. *Vasa opophora*. A peculiar form of vessels in plants, consisting of *branched* anastomosing tubes, lying in no definite position with regard to other tissue, said to be contractile, though destitute of valves in their interior. They occur in the milky cichoraceous plants, in the root of dandelion, &c. The larger trunks were called by Schultz *vasa expansa;* the fine ramifications, *vasa contracta*. From their containing a peculiar liquid, called *latex*, they have been termed *laticiferous tissue*, and, more recently, *cinenchyma*.

VESTA. A telescopic planet, situated in the solar system between Mars and Jupiter, discovered by Dr. Olbers, of Bremen, in 1807. She describes her orbit in three years, sixty-six days, four hours.

She is thought to be 225 millions of miles distant from the sun.

VESU′VIAN or I′DOCRASE. A stone, generally of a reddish-brown colour, similar in appearance to common *garnet.* It is found crystallized among substances thrown out by volcanoes, and, as its name indicates, particularly by Mount Vesuvius. The rare blue variety is found at Sonneland, in Tellemark in Norway. At Naples it is cut into ring-stones.

VEXI′LLUM (dim. of *velum,* a veil). A standard or small banner; a term applied to the upper petal of a papilionaceous corolla, from its erect and expanded state. For the use of the term *vexillary,* see *Vernation.*

VIBRATING SURFACES. The phenomena of the production of figures by strewing sand on vibrating surfaces, commonly called *acoustic figures,* have been noticed under the terms "Sonorous Figures" and "Nodal Lines." Mr. Wheatstone shows that all the figures of these vibrating surfaces are the resultants of very simple modes of oscillation, occurring isochronously, and superposed upon one another; the resultant figure varying with the component modes of the vibration, the number of the superpositions, and the angles at which they are superposed. When the vibrations of the superposed modes are unequal in intensity, there is formed a figure intermediate between the perfect resultant and one of its compounds: these figures are called *imperfect resultants.*

VIBRA′TION (*vibro,* to quiver). *Oscillation.* A term applied to those motions of a body, by which, when its constituent particles have been disturbed from their equilibriums, they return to a state of repose. This is effected by the particles alternately approaching the position of rest and receding from it, until, after some time, the equilibrium is restored. See *Interval.*

1. The *Theory of Vibrations* has been adopted for explaining the phenomena of light, which are supposed to depend on the vibrations, or undulations, of a fluid called ether, diffused through all nature, and set in motion by the presence of luminous bodies. See *Emission.*

2. Bodies of a *linear* form are capable of exhibiting three kinds of vibration, the transverse, the longitudinal, and the rotatory. 1. If a piece of whip-cord be strained tight and firmly held at each end, and be then pulled in the middle from its position of rest, and suddenly let go, it undergoes a series of *transverse* vibrations. 2. If the cord be held at one end, and a weight attached to the other end be raised, and then let go, a series of *longitudinal* vibrations is produced. 3. Lastly, if the cord be twisted by means of the weight, and the weight be suddenly allowed to fall, the cord exhibits a series of *rotatory* vibrations.

3. *Vibrations, co-existence of.* This, and the equivalent term *superposition of vibrations,* denote a principle in mechanics, which seems to be only a particular case of what might be called the co-existence or superposition of small changes of any kind. For instance, two stones are dropped into water at two different places, and at a certain time, on a certain part of the surface; in this case, the resulting waves cross one another. If there be a particle which is at the same time raised on both waves, say a tenth of an inch from one, and three-tenths of an inch from the other, that particle will altogether be raised four tenths of an inch, or insensibly near to it.—*Pen. Cycl.*

VIBRIO′NIDÆ. A tribe of animalcules, named from the genus *vibrio,* and commonly known as microscopic eels. One species, the *vibrio tritici,* is parasitic on wheat, and it has been computed that 50,000 of them might be contained in a single grain of wheat.

VI′CIEÆ (*vicia,* the vetch). A tribe of leguminous plants, having a papilionaceous corolla, diadelphous stamens, continuous legumes, thick farinaceous cotyledons, not changing in germination, and a radicle curved inward. They include the vetches, the bean, the pea, &c.

VILLOSITY (*villosus,* shaggy). Shagginess; a term denoting that state of hairiness in plants, in which the hairs are very long, very soft, erect, and straight, as in epilobium hirsutum. When in excess, the hairs are termed *crini.*

VIMEN. A long and flexible shoot of plants. This word is, however, seldom used, the adjective being employed instead: thus, we say, *rami viminei,* or *caulis vimineus,* and so on. See *Virgate.*

VI′NCULUM. Literally, a bond; and, hence, the term denotes, in algebra, a line sometimes used instead of brackets, and drawn above quantities which are connected; thus $a - \overline{b - c}$ is the same as $a - (b - c)$; and $\overline{a - b + c} \times \overline{d - e}$ means the same as $(a - b + c) \times (d - e)$.

The line which separates the numerator from the denominator of a fraction may be regarded as a sort of vinculum, corresponding, in fact, in *Division* to the bracket in *Multiplication*. Thus, $\frac{a+b-c}{5}$ implies that the whole quantity $a+b-c$ is to be divided by 5.

VINDEMIA'TRIX. *Prævindemiatrix.* A star of the third magnitude in the constellation Virgo; it took its name from the vintage.

VINE. *Viticula.* A stem which trails along the ground without rooting, or entangles itself with other plants, to which it adheres by means of its tendrils, as in the vine and the cucumber. The term is now seldom used. De Candolle refers this kind of stem to the sarmentum or runner, from which, however, it essentially differs in its not rooting.

VINEGAR. *Acetic acid.* A hydrated acid derived by the action of air upon alcoholic liquors, as wine and beer; but the remarkable discovery of Dr. J. Davy, that platinum black in contact with alcohol became incandescent, and gave rise to acetic acid, first led Dobereiner to the discovery that alcohol, by absorbing oxygen, gives rise to water and acetic acid, without disengaging carbonic acid.

Wood vinegar, or pyroligneous acid, is prepared on a large scale by the distillati[illegible] of wood, generally that of oak coppice deprived of the bark, which is used in tanning.

VIOLA'CEÆ (*viola*, a violet). The Violet tribe of Dicotyledonous plants. Herbs with *leaves* usually alternate; *flowers* polypetalous; *petals* hypogynous; *stamens* alternate with the petals; *ovarium* 1-celled, many-seeded.

VI'PERIDÆ. The Venom-snakes, including the varieties of the *vipera* or adder, the naia, the rattle-snake, the horn-snake, &c.

VIRGATE (*virga*, a twig). A *virgate* stem differs from a *vimineous* stem only in being less flexible. See *Vimen.*

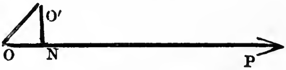
VIRGO. The Virgin; the sixth of the zodiacal constellations, consisting of 110 stars, the principal of which is Spica Virginis. It denotes the third month of winter, extending from the 20th of February to the 20th of March. In the Egyptian zodiacs, *famenoth*, or the fruitful woman, holds an ear of corn in her hand. The Greeks were led into the error of calling this sign παρθένος, in consequence of the Egyptian word signifying 'endowed with beauty;' but it also involves the idea of fruitfulness.

VIRGULTUM. The name sometimes given to a young slender branch of a tree or shrub.

VIRTUAL FOCUS. A term in Optics denoting the point from which rays of light, having been rendered divergent by reflection or refraction, appear to issue.

VIRTUAL VELOCITY. The velocity which a body in a state of equilibrium would actually acquire during the first instant of its motion, in case of the equilibrium being disturbed. If we suppose a point at which any force acts to be slightly displaced, and from the new position of the point a perpendicular to be dropped upon the direction of the force, then the line intercepted between the foot of this perpendicular and the original position of the point is called the *Virtual Velocity* of the force.

1. Thus, let O be the point at which the force P acts, and suppose it to be slightly displaced, so as to be brought into the position O′; from O′ draw the perpendicular O′N on OP, then ON is the Virtual Velocity of P.



2. The *Principle of Virtual Velocities* is thus stated: When a system of bodies is in equilibrium under the action of any forces, then if the system be very slightly displaced, the sum of each force multiplied by its virtual velocity will equal *zero*.

VIS. Force; a term employed by the older writers on mechanics to denote power or force of any kind. Thus we have *vis mortua* and *vis viva;* the former relating to the pressure, the latter to the force of a body in motion, estimated by the distance to which the body goes; *vis motrix*, *vis acceleratrix*, *vis inertiæ*, &c.

VIS INERTIÆ. Inertness, or the principle of inactivity, by which a body perseveres in the same state of rest or motion, in a straight line, unless obliged to change it by a foreign force.

VISCOUS FERMENTATION. At a temperature between 86° and 104°, the saccharine juices of plants containing albumen or other azotised matter, undergo a species of fermentation, which is different from the *vinous*, combustible gases being evolved with carbonic acid, and a gummy matter formed, having the composition of gum Arabic, which renders the liquid ropy and thick, and hence the application of the name *viscous* to this fermentation. See *Fermentation.*

VISION. In Optics, the sense of sight; this sense is produced by certain nerves which convey to the brain intelligence of figures impressed by rays of light upon the retina of the eye. *Short-sightedness* is occasioned by the convergence of the rays to a point before they fall upon the retina, and a concave lens is employed to delay their convergence. *Long-sightedness* is occasioned by the non-conveyance of the rays to a point until they have passed the retina, and a convex lens is employed to promote their convergence.

1. *Vision recrossed.* A term applied by Captain J. Grover to a distinct tribe of ocular phenomena, in which objects placed between and very near the eyes, such as the two sides of the nose, appear on opposite sides of the sphere of vision: the object on the right side of the nose being seen to the left by the right eye, and that which is on the left of the nose being seen to the right by the left eye. It is supposed that, besides the two external or cranial eyes, " man is endowed with an internal cerebral organ, which performs the office of a *third eye*, by being the common recipient of impressions propagated either from one or both of the external eyes; and the mind, in her chamber of percipience, steers with regard to external objects by the same principle on which the mariner steers by his compass.

2. "Thus the two cranial eyes are analogous, in principle and situation, to two magnetic compasses placed upon a ship's deck; while the third, or cerebral eye, corresponds to another compass in the cabin below; and the mind, situated like the captain-mariner in his cabin, knows, from consulting the cerebral eye, on what point of direction the body is steering; although the mind no more perceives either any external object, nor yet any image in the cranial eye, than the mariner perceives (even in the vulgar sense of the word perceiving) the far-off land, or haven, towards which he is surely making his way."

VISUAL (*visus*, sight). That which accompanies vision: the *visual angle* is the angle under which a body is seen; and the apparent magnitude of the same object, when viewed at different distances, depends on the size of the *visual angle*—that is, the angle formed at the eye by the rays proceeding from the extremities of the object. See *Theodolite.*

VITA'CEÆ (*vitis*, a vine). The Vine tribe of Dicotyledonous plants. Climbing shrubs with tumid joints, and *leaves* stipulate; *flowers* polypetalous, on ramose peduncles; *stamens* hypogynous; *ovarium* 2-celled; *fruit* baccate; *seeds* albuminous.

VITAL AIR. A term applied to oxygen gas, from its being indispensable to the maintenance of life. It was formerly called dephlogisticated air, empyreal air, &c.

VITE'LLUS. Literally, the yoke of an egg; a term applied by Gœrtner to a fleshy sac occasionally interposed between the albumen and the ovule, in plants, enveloping the latter. This sac is usually referred to the *vesicula amnios* of Malpighi.

VITRIFICA'TION (*vitrum*, glass, *fio*, to become). The conversion of a substance, as silica, into glass.

VI'TRIOL (*vitrum*, glass). A term originally applied to any crystalline body possessing a certain degree of transparency, but now restricted to three sulphates—that of iron, called ferrous oxide, copperas, or *green vitriol;* that of copper, or *blue vitriol;* and that of zinc, or *white vitriol.*

1. When *Green Vitriol* is exposed to heat in a retort, it first gives off water of crystallization, or *phlegm* of vitriol; next comes an acid, called *spirit* of vitriol; then a stronger acid, called *oil* of vitriol; the latter part of this becomes solid, and has been called *glacial* oil of vitriol.

2. The *stalactitic cobalt-vitriol*, from Herrengrund in Hungary, is sulphate of magnesia, coloured red by oxide of cobalt.

VITTÆ (*vitta*, a riband). A term applied, in Botany, to little clavate vessels of oil found in the coat of the fruit of umbelliferous plants; when situated in the *valleculæ*, or depressions between the ridges of the fruit, they are termed *dorsal;* when on the face of the fruit, *commissural.* They offer a special case of the *vasa propria*, or receptacles of secretion. Modifications of these vessels are found in the leaves of the orange and of all myrtaceous plants, where they are called *crypts*, *vesicular glands*, or receptacles of oil. See *Vessels, Milk, &c.*

VIVE'RRIDÆ (*viverra*, the civet). The civets; a group of animals placed by

Cuvier between the dogs and the hyenas, which are immediately followed by the cats. They comprise the civets, properly so called; the genets; the paradoxure; the *mangoustes;* the suricates; and the *mangues.*

VI'VIANITE. Phosphate of iron; a mineral occurring in variously grouped crystals in Bodenmais in Bavaria, in Cornwall, &c., massive and pulverulent.

VIVI'PAROUS (*vivus,* alive, *pario,* to bring forth). A term applied to animals which bring forth their young alive and perfect, as distinguished from *oviparous* animals, which produce their young in the egg.

VOICE, SCALE OF. The scale of the human voice comprises four octaves, viz. from *mi* or E in the bass, to *mi* or E^4 in the treble clef. Of this scale, the male voice extends from E in the bass to C^3 in the treble; the female, from F^1 to E^4 in the treble

1. *Subordinate scales.* There are four scales of vocal music. The scale of the male voice is distinguished into *bass* and *tenor,* each containing two octaves, the bass extending from E to F^2, the tenor from C^1 to C^3. Eleven notes are common to the bass and the tenor scales. The scale of the female voice is distinguished into *contralto* and *soprano,* each containing two octaves, the contralto ranging from F^1 to F^3, the soprano from C^2 to E^4. Twelve notes are common to the tenor and the contralto, eight to the tenor and the soprano scales. The terms *alto, contralto,* and *counter-tenor* are synonymous.

2. The *barytone* is a scale of the male voice intermediate between the bass and the tenor, and ranging from A to F^2. The *mezzo-soprano* is a scale of the female voice intermediate between the contralto and the soprano, and ranging from A^1 to A^3.

3. *Registers.* The compass of the soprano and of some other voices is distinguished into two registers, the *natural* and the *falsetto.* The former is termed by the Italians *voce di petto,* or chest-voice; the latter *voce di testa,* or head-voice. The Italians combine these two registers by a third, called *mezzo falso,* or middle falsetto. The uppermost notes of the falsetto are sometimes called *flautino,* or flute register. When the pitch of a voice proceeds lower than the natural register, such a voice is called *basso falsetto,* or lower falsetto.

4. *Song-note; Speech-note.* 1. The song-note is a musical sound of some fixed pitch in the musical scale. The scales comprising the song sounds are described under the articles *chromatic, diatonic,* and *enharmonic* scales. 2. The speech-note is of two kinds, the *simple* and the *compound;* the former consists of a single rising or falling of the voice, ranging from a semitone to an octave; the latter consists of a falling and a rising, or of a rising and a falling, combined in various circumflexes.

VOLATI'LITY (*volatilis,* from *volo,* to fly). A property of bodies, by which they are disposed to assume the state of vapour and fly off, on the application of heat.

VOLCANIC BOMBS. Masses of melted lava sometimes thrown out by volcanoes; these, as they fall, assume rounded forms, like bomb-shells, and are often elongated into the shape of a pear.

VOLCANIC FOCI. The subterranean centres of action in volcanoes, where the heat is supposed to be in the highest degree of energy.

VOLCANIC ROCKS. The geological designation of the fourth or most recent class of rocks, which are evidently composed of lavas, or masses of melted rocky matter, which have been sent upward by volcanoes. This kind of rock is also called *igneous rock.*

VO'LCANITE. Another name for *augite,* from its being found among volcanic rocks; but it is supposed to have existed prior to the eruption and ejection of the lava. See *Augite.*

VOLCANO (*Vulcanus,* the fabled god of fire). An opening in the earth's surface, presenting the general appearance of a vent of subterranean fire, from which smoke, cinders, ashes, and sometimes large fragments of rock, and vast quantities of melted rocky matter, are continually discharged.

Mud volcanoes are so termed from their having eruptions of mud only. The mountain of Maccaluba in Sicily, and some hills at the town of Taman in the Crimea, are distinguished by eruptions of this kind.

Extinct volcanoes are those mountains which bear evident marks of having at some very distant period been outlets of fire.

VOLITATRI'CES (*volito,* to flutter). Gliders; a term applied by Mac Gillivray to an order of birds, which have a peculiarly light and bounding flight, are incapable of walking efficiently or of advancing to any distance on the ground or on trees. They are divided into the Cypselinæ or Swifts, the Hirundinæ or Swallows, and the Caprimulginæ or Goatsuckers.

VO'LKONSKOITE. A mineral containing oxide of chromium, and found in thin veins and nests in Mount Jessmictski, in Siberia.

VOLTA-ELECTROMETER. A new instrument for the exact measurement of electric currents. The current to be measured is made to pass through water acidulated by sulphuric acid, and the gases evolved by its decomposition are collected and measured, thereby giving at once an expression of the quantity of electricity which has passed. The principle on which this conclusion is founded is this new *law*, "that the decomposing action of any current of Electricity is constant for a constant quantity of electricity."

VOLTA-METER. An instrument for measuring the intensity of the electric current. It consists of a cell of decomposition, containing dilute sulphuric acid, and so formed as to admit of the collection and measurement of the evolved gases. The electrolyte which best fulfils all the requirements, is water; and any arrangement in which a stream of electricity is made to decompose it, if furnished with the means for measuring the quantity of gas thus generated, may be regarded as a volta-meter.

VOLTAIC CIRCLES. If a plate of zinc and a plate of copper be immersed to a certain depth in a vessel containing dilute sulphuric acid, and connected together by direct contact, a current of positive electricity passes uninterruptedly from the zinc through the liquid to the copper, and from the copper to the zinc, in the direction of the arrows. Such an arrangement is termed a *simple voltaic circle*. When it is required to produce more decided effects, a series of these plates is combined, forming what is called a *compound voltaic circle*.

VOLTAIC ELECTRICITY. The phenomena of electricity, observed by Galvani, and hence termed *Galvanism* and *animal electricity*, were attributed by Volta to the disturbance of the electric equilibrium by the contact of two dissimilar metals. The identity of the common and the galvanic electricities was proved by the discovery of the voltaic pile, and the science has from that period been termed by some writers, *Voltaism* or *Voltaic Electricity*.

VO'LTATYPE. A term synonymous with *electrotype*, applied to a new art of *plating* performed by electro-chemical action.

VOLTZITE. Oxysulphuret of zinc, occurring in the form of small hemispheres, divisible into thin layers. It occurs at Roziers in France, and, as is said, in Cornwall.

VOLUBLE (*volubilis*, from *volvo*, to twist). Twisting; as applied to stems which twist or twine round other bodies, that of the hop to the right, that of the bindweed to the left.

VOLUME (*volumen*, from *volvo*, to roll). The *apparent* space which a body occupies is called its *volume;* the *effective* space which the same body occupies or its real bulk of matter, is its *mass;* the relation of the mass to the volume (or the quotient of the one by the other) is its *density;* and the empty spaces, or voids, which render the volume larger than the mass, are its *pores*.

Definite Volumes. The union of gases is always effected in simple proportions of their volumes: a volume of one gas combines with an equal volume, or twice or three times the volume, of another gas, and in no intermediate proportion; this is called the law of *definite volumes*.

VOLU'TIDÆ. The Volutes; a family of testaceous, carnivorous gasteropods, named from the typical genus *voluta;* the column of the shell is regularly plaited, and the mantle much developed in the typical species.

VOLUTION (*volutus*, rolled). A term synonymous in Malacology with *whorl*.

VOLVA (*volo*, to roll). The *wrapper*, or involucrum-like base of the stipes of agaric. It originally was a bag enveloping the whole plant, and was left at the foot of the stipes, when the plant elongated and burst through it.

VORTICES, HYPOTHESIS OF (*vortex*, a whirlpool). The primary hypothesis of the natural philosophy of Descartes was, that the universe is a *plenum*, that is, without any vacuum or unoccupied space; and that the *atoms* of matter moved in numerous *vortices*, which carried the heavenly bodies around their several centres of motion; such as the planets about the sun, and, perhaps, similar planets around the fixed stars.

VULPECULA ET ANSER. The Fox and the Goose; a modern northern constellation, consisting of thirty-seven stars, and situated immediately above Aquila and Sagitta.

VU'LPIKIN. *Vulpinic acid.* An acid substance obtained from the *evernia vulpina* of Achard, or the *lichen vulpinus* of Linnæus.

VU'LPINITE. A mineral substance consisting of sulphate of lime and silica, and occurring together with granular foliated limestone at Vulpino in Italy, where it is employed for ornamental works under the name of *marmo bardiglio*.

VULTU'RIDÆ. The Vulture tribe; a family of the Raptores, or rapacious birds, characterized by their untoothed beak, and by the moderate curvature of their talons, as compared with the falcons, and by their head and part of their neck being destitute of feathers.

W

WACKE'. A simple trap rock nearly allied to basalt, of which it may be considered as a soft and earthy variety. Ure states that it never contains augite or olivine; sometimes it is vesicular, presenting amygdaloidal cavities filled with various substances.

WADD. A technical name for plumbago or black lead. *Black wadd* is an ore of manganese found in Derbyshire, remarkable for its property of taking fire when mixed with lintseed oil.

WA'GNERITE. A rare mineral, formerly confounded with the Brazilian topaz. It consists of the phosphoric and the fluoric acids, magnesia, iron, and manganese. It occurs at Salzburg in small veins of quartz in clay-slate.

WAKE OF A SHIP. A nautical term denoting the smooth water which is astern of a ship under sail. It serves to show the way the ship makes: if the wake be right astern, she makes her way forward; if it be to leeward a point or two, she falls to the leeward of her course. A ship is said to *stay to the weather of her wake*, when, in her staying, she is so quick, that she does not fall to leeward upon a tack, but that when she is tacked, her wake is to the leeward; and it is a sign that she feels her helm very well, and is quick of steerage.

WANING. Declining in power. The term is applied to the moon, as decreasing in her light, as she proceeds from the full to the change.

WARM-BLOODED ANIMALS. A term applied to two classes of vertebrate animals, viz. the mammals and the birds. In these there are two hearts, perfectly distinct from each other; and a twofold *circulation*, viz. that which takes place in the lungs, called the *pulmonic*, and that which takes place through the entire system, called the *systemic* circulation.

WARP. The deposit of muddy waters, artificially introduced into low lands. In the operation of *warping*, it is only necessary to produce a stagnation of the water for a few hours to have a copious deposit, leaving the water clear over it.

WASH. A technical term for the fermented liquor, of any kind, from which spirit is intended to be distilled.

WATER. *Protoxide of hydrogen;* a liquid produced by the combustion of oxygen and hydrogen, consisting of two volumes of the latter to one volume of the former gas, and of eight parts of the former to one of the latter by weight.

Water, oxygenated. Peroxide of hydrogen; a liquid containing twice as much oxygen as water, but less volatile, having a metallic taste, and instantly bleaching litmus and other organic colouring matters.

WATER OF CRYSTALLIZATION. That portion of water which combines in a dry state with many substances, forming an essential condition of their crystalline character. Salts which retain this water so feebly, that it passes off on exposure to the air, leaving the salt in a pulverulent state, are termed *efflorescent;* while those which have so great an affinity for it, that their crystals attract more of it from the air, and become dissolved in it, are called *deliquescent.*

WATER-CLOCK. *Clepsydra.* A cylindrical vessel with its surface divided by lines into portions which are to one another as the odd numbers, 1, 3, 5, 7, &c., taken backward. Supposing such a vessel required six hours to empty itself, let it be divided into 36 equal parts; then, beginning from the surface, take eleven of those parts for the first hour, nine for the second, seven for the third, five for the fourth, three for the fifth, and one for the sixth; it will be found that the surface of the water will descend regularly through each of those divisions in an hour.

WATER-GILDING. The process of gilding by the application of an amalgam of gold to the surface of metals; the mercury of the amalgam is driven off by heat, and a thin coating of gold remains.

WATER-SPOUT. A meteorological phenomenon of the same class probably as the whirlwinds which raise pillars of sand in the deserts of Africa. A column of water is observed to descend from a cloud, until it meets a column rising from the sea; the two unite, and often move with great rapidity, until they meet with some opposing wind, or other cause, which destroys them.

WATER-TIGHT. That degree of closeness of a vessel or tube, which prevents the ingress or the egress of water.

WATER-WHEEL. A machine invented by Segner for employing the pressure of water in the production of a rotatory motion. It consists of a hollow cylinder, turning upon a vertical axis, and kept full of water. At its base are several pipes for the issue of the water; the apertures of the pipes are all in one direction, tangential to the circumference of the cylinder. The pressure produced against the sides of the pipes produces a motion of the cylinder in an opposite direction. The motion ceases if the water flow in an opposite direction from an equal number of pipes.

WATERS, MINERAL. A term conventionally applied to waters distinguished from all others by their peculiar ingredients or supposed medicinal effects.

1. *Chalybeate waters* contain iron, most commonly in the state of carbonate dissolved in carbonic acid, the proportion rarely exceeding one grain in a pound of water. They occur at Brighton, Cheltenham, Bath, &c.

2. *Sulphureous waters* contain sulphuretted hydrogen gas, in a proportion not exceeding that of air in spring water, and no oxygen. They are recognized by their peculiar odour, and by their blackening silver and salts of lead. They occur at Harrowgate, Aix-la-Chapelle, &c.

3. *Saline waters* contain various salts of lime and magnesia, and generally common salt; their density is always considerably higher than that of pure water. They occur at Leamington, Cheltenham, Seidlitz, &c. *Sea-water* contains $3\frac{1}{2}$ per cent. of saline matter, and has a density of 1.0274.

WAVE. The simplest idea of a *wave* may be obtained by observing the curve produced by a cord when its equilibrium has been disturbed. The portion of the curve which rises above the original position of the cord, is the *elevation* of the wave; that which falls below the original position of the cord, is the *depression* of the wave. These movements occur in solid, in liquid, and in aeriform bodies. See *Undulation*.

WA'VELLITE. Phosphate of alumina; a mineral substance which was originally mistaken for a hydrate of pure alumina, and hence called *hydrargyllite*. It occurs in Devonshire, where it was first found by Dr. Wavell; at Amberg in Bavaria, where it is called *lasionite;* in Greeenland, &c.

WAVY. *Undulated*. This term is applied, in botanical language, to a leaf, which has an uneven, alternately convex and concave margin, as in holly. In entomology, it is applied to an insect which has the margin of its body marked by a series of arched incisions.

WEALD CLAY. The upper portion of the Wealden Formation, consisting of beds of clay, sandstone, calcareous sandstone, conglomerate, limestone, and ironstone. The term *weald* has been given to a valley, or tract of country, lying between the North and the South Downs of Kent and Sussex.

WEALDEN ROCKS (*wald*, German, a wood). A series of rocks which immediately cover the upper oolites without any breach of continuity. They are essentially of fresh-water origin, and in this respect they bear the same relation to our older secondary rocks which the old carboniferous system bears to the inferior palæozoic groups. The lowest part of this formation is the *Purbeck Limestone;* above this is the *Hastings Sand;* the uppermost portion is the *Weald Clay.*

WEATHER-GLASS. The popular name for the barometer, the variations of this instrument being commonly supposed to indicate approaching changes in the state of the weather. In former times, the same appellation was given to the thermometer.

WE'BSTERITE. *Aluminite.* Hydrous subsulphate of alumina, found in Sussex and at Halle in Magdeburg, and formerly mistaken for pure alumina, also for hydrate of alumina with mechanically admixed sulphate of lime. This mineral must not be confounded with another substance also called *aluminite* or *alum-stone* (alunite of some mineralogists) from Tolfa, &c., which is a basic sulphate of alumina and potassa.

WEDGE. One of the mechanical powers, consisting of a triangular prism, or a pair of inclined planes having a common base, made of some hard substance, and employed to remove two objects from one another laterally, or to cleave asunder the parts of a body. When the edge is introduced, the wedge is driven forward by a violent blow, as from a hammer, which generates an enormous force, of momentary duration. Nails, awls, needles, and many cutting instruments act on this principle; the stones of an arch are truncated wedges.

WEEK, DAYS OF. The English names of the days of the week are derived from the Saxons; and these partly adopted the names from the more civilized nations of antiquity. Tuesday, Wednesday, Thursday, and Friday are derived respectively, from the names of Tiw, Woden, Thor, and Friga, deities of the ancient Saxons; Thor being the god of thunder, as well as the ancient Jove; and Friga, the wife of Woden. Saturday, Sunday, and Monday, are derived respectively, from the Saxon Seterne's, Sun's, and Moon's day.

WEIGHT. The comparative measure of the gravity of bodies at the earth's surface. In mechanics, *weight* is the resistance, or the thing to be moved by the force of the power: the stone is the weight to be moved by the force of the lever or bar.

WEIGHT OF THE ATMOSPHERE. The mean weight of the atmosphere at the surface of the sea is generally estimated as equal to the weight of a column of mercury of 30 inches in height, which is about 15 pounds on the square inch of surface, and is equivalent to a column of water of nearly 34 feet in height. Hence the surface of the globe sustains a weight of 11,449,000,000 hundreds of millions of pounds.

WEIGHTS AND MEASURES. The following *standards* have been sanctioned by Parliament for the purpose of ascertaining and establishing uniformity of weights and measures:—

ENGLISH MEASURES AND WEIGHTS.

1. *Lineal, Superficial, and Solid measures.* The length of the pendulum, vibrating seconds of mean time in the latitude of London at 62° Fahr., and in a vacuum at the level of the sea, is equal to 39.1393 inches of the Brass "Standard Yard of 1760," or "Imperial Standard Yard." Hence the length of the yard to that of the pendulum is in the proportion of 36 inches to 39.1393 inches, or of the number 360,000 to the number 391.393: so that, if the length of the pendulum be divided into 391.393 equal parts, then will 10,000 of these parts be the length of an inch, according to the imperial standard.

2. The English *land-chain* = 22 yards or 66 feet, and contains 100 links; 1 link = 7.92 inches. The *square chain* = 484 square yards, and 10 square chains = 1 acre.

3. *Troy and Avoirdupois weights.* The old Troy pound is the standard unit of weight, and contains 5760 grains; while the avoirdupois pound, now in use, contains 7000 grains. Hence, the standard pound is to the common pound as 5760 grains to 7000 grains; or as the number 144 to the number 175. According to the *standard*, one cubic inch of distilled water at 62° Fahr., the barometer being at 30 inches, weighs 252.458 *troy grains*, one pound = 5760 grains. (A cubic inch of distilled water, at the maximum density, weighs 253 troy grains). Then 175 troy pounds = 144 avoirdupois pounds; and 175 troy ounces = 192 avoidupois ounces. A *cubic foot of distilled water* at 62° Fahr. weights almost *exactly* 997.136969 ounces avoirdupois, and at the maximum density, 999.2777 ounces avoirdupois.

4. *Imperial Gallon Measure.* This is the measure for all sorts of liquids, corn, and other dry goods. Ten pounds avoirdupois, or 277.274 cubic inches of distilled water at 62° Fahr., the barometer being at 30 inches, are the contents of the New Imperial Gallon. As 252.458 grains : 1 cubic inch :: 10lbs. or 70,000 grains : 277.274 cubic inches, which is, consequently, the content of the imperial gallon. The proportion of the *imperial gallon* to the *wine gallon* is as 6 to 5 nearly, to the ale gallon as 59 to 60 nearly, and to the corn gallon as 33 to 32 nearly; its proportion to the sterling pint is as 59 to 22 nearly.

5. *Heaped Measure.* Eighty pounds avoirdupois, or 2218.192 cubic inches of distilled water at 62° Fahr., the barometer being at 30 inches, are the contents of the New Bushel, which is to be made

"round, with a plain and even bottom, being 19½ inches from outside to outside," and to be heaped in the form of a cone to the height of 6 inches. This is the measure for coal, culm, lime, fish, potatoes, fruit, &c.

6. The depth of the Imperial Bushel is required by the Act to be 8 inches, though this is not expressed; because the height of the heap or cone is 6 inches, and this must be equal to three-fourths of the depth. The proportion of the Imperial Bushel to the Linlithgow wheat firlot is as 106 to 105 nearly, and to the barley firlot as 92 to 133 nearly.

7. *Dimensions of the Dry Measures.* "The diameter shall be at least double the depth, and the height of the cone or heap shall be equal to three-fourths of the depth."

FRENCH MEASURES AND WEIGHTS.

8. *Mètre.* The standard unit of the *itinerary* and other *measures of length* is the *Mètre.* It was found that a quadrant of a meridian lying between the North Pole and the equator measured 5,130,470 toises, or 10,936,578 English yards; and the ten-millionth part of this quantity, which was to form the standard unit, was therefore equal to 3 pieds 11 $\frac{296}{1000}$ lignes, or 1.093578 English yards. Upon this, the Académie des Sciences devised the following nomenclature in the eighth year of the Republic:—

9. The words deci (tenth of), centi (hundredth of), milli (thousandth of), being added to that expressing the unit, served to denominate the subdivisions; and the words deca (ten), hecto (one hundred), kilo (thousand), myria (ten thousand), expressed the multiple of the unit. Thus the *mètre* contained 10 décimètres; the *decimètre* 10 centimètres; the *centimètre* 10 millimètres. The *décamètre* expressed ten mètres; the *hectomètre*, 100; the *kilomètre*, 1000; and the *myriamètre*, 10,000 mètres. The kilomètre is considered as the minute of the new geographical degree, and is equivalent to 513 toises old measure, and to 1093 yards, 1 foot, 10 inches, English.

10. *Toise.* The new toise was fixed at two metres exactly, making an increase of 2½ per cent on the 'toise of Paris.' This new toise is divided as formerly into 6 feet, each foot into 12 inches, and the inch into 12 lines. The *toise* is therefore equal to 2 metres, or 6 feet, 6.42 inches English; the *toise quarrée*, to 3.7987 square metres, or 3 yards, 1 foot, 84.096 inches English; the *pied quarré*, to 0.4220 square metres, or 3 feet, 29.344 inches English.

11. *Lieue.* The lieue, by which distances were reckoned in France, was not the same in every province; of the following four, however, the proportions were determined:—1, the *lieue de poste*, to regulate the charges on travellers, equal to 2000 toises, old measure, or 3898 mètres, or 4262yds. 2ft. 6in. English; 2, the *lieue marine*, twenty in the degree, adopted by geographers, = 2850 toises, or 5554.75 mètres, or 6074yds. 2ft. English; 3, the *lieue commune*, twenty-five in the degree, = 2280 toises, or 4443.80 mètres, or 4859yds. 4in. English; and, 4, *lieue moyenne*, = 2565 toises, or 5000 mètres, or 5470yds. English.

12. *Liquid and Dry Measures.* The *litre*, adopted in the place of the *pinte*, is equal to 1.074 pinte, and contains 1.761 English pint. Its form is cylindrical, in height double of its diameter. The *litre* is a cubic decimètre; the *decalitre* contains 10 cubic decimètres; the *decilitre*, 1-10th of a cubic decimètre. The *hectolitre* contains 100 cubic decimètres; the *kilolitre*, 1 cubic mètre, or 1000 cubic decimètres. The Tonneau de Bordeaux contains 931.318 *litres*, or 1640 pints English.

13. *Land Measures.* The unit of land measures is a square, each side of which is 10 mètres in length, and called *are.* It is subdivided into 100 parts, called *centiares*, each a square mètre. There is a larger measure denominated *hectare*, containing 100 ares, and answering to a square, each side of which is 100 mètres. Before the establishment of the decimal system, the *arpent* was generally used for the measurement of land.

14. *Solid Measures.* The measure in use for the sale of timber is called *stère*, and is a cubic mètre; the *decistere* is 1-10th of a cubic mètre.

15. *Dry and heaped Measures.* The *boisseau usuel*, such as its dimensions are now fixed, is smaller than the former, called *boisseau de Paris*, by $\frac{1}{25}$; its subdivisions are the demi-boisseau, and the quart de boisseau. The *double boisseau* is equal to 25 litres, or 5 gallons, 2 quarts; the *boisseau* to 12 litres, 50, or 2 gallons, 3 quarts; the *demi-boisseau* to six litres, 25, or 1 gallon, 3 pints; the *quart de boisseau* to 3 litres, 12, or 2 quarts, 1 pint, 2 gills. This measure serves for the sale of corn, coals, salt, lime, &c.

16. The *kilogramme* represents the

weight of a cubic decimètre of water at the temperature of four degrees above that of melting ice. The *millier* is 1000 kilogrammes, or the weight of a tun of sea-water; the *quintal* is 100 kilogrammes; the *hectogramme* is 1-10th of a kilogramme, the *decagramme* 1-100th, the *gramme* 1-1000th, the *decigramme* 1-10,000th of a kilogramme. The unit used in weighing is the *kilogramme*. It has been fixed by, and is equal to, the specific weight of the distilled water contained in one cubic decimètre. It is equal to 2 livres, 5 gros, 35 grains, $\frac{15}{100}$ poids de marc, and to 2lbs. 8oz. 3dwt. 6.355 grains troy weight, and 2lbs. 2oz. 4 drams, 16 grains avoirdupois weight. The *kilogramme* is divided into two *livres;* the livre is subdivided into 16 ounces, the ounce into 8 gros, and the gros into 72 grains. This new livre exceeds the old one (poids de marc) by $\frac{2}{100}$, so that, to reduce kilogrammes into old measure, we must multiply by 2, and add $\frac{2}{100}$.

17. *Terms employed in the 16th century.* The measures appear in most cases to have reference to the human body. The breadth (not the length) of four barleycorns make a *digit*, or finger-breadth; four digits make a *palm* (measured across the middle joints of the fingers, and the 24th part of the height of a well-proportioned man); four palms are a *foot*, or a 6th of the height of a man; a foot and a half is a *cubit*, measured from the elbow to the ends of the extended fingers, the 4th of the height of a man; ten palms, or two feet and a half are a *step* (gressus); two steps, or five feet, are a *pace* (passus); ten feet are a *perch;* a hundred and twenty-five paces are an Italic *stadium;* eight stadia, or a thousand paces, are an Italic *mile;* four Italic miles are a German mile; and five Italic miles are a Swiss mile.

WEISS-ERTZ. The name given by Werner to some varieties of *arsenical pyrites* or *mispickel*, which contain accidentally admixed silver.

WELDING. A property of certain metals, as platinum, by which at a white heat, an incipient fusion takes place, which covers their surface with a kind of varnish, so that, when brought into contact in this state, different species may be permanently united by forging.

WELTER'S TUBE. A safety-tube, introduced into a Woolfe's bottle, to prevent retrograde pressure. The tube is twice curved and expanded at one part into a bulb; water is poured into the tube till the bulb is half full; when absorption takes place, the water rises in the bulb until none remains in the tube, and then the air rushes in; on the other hand, no gas can escape, since it has to overcome the pressure of a high column of water in the perpendicular tube.

WENLOCK LIMESTONE and SHALE. A component part of the Upper Silurian Rocks, 1800 feet in thickness; it consists of a crystalline grey or blue *limestone*, abounding in corals, encrinites, marine mollusca, and crustaceous animals of the trilobite family; and a dark-coloured *shale*, with nodules of earthy limestone, and containing mollusca and trilobites.

WERNERIAN THEORY. Werner supposed that all the geological strata were originally in solution in an aqueous fluid, from which they were deposited or precipitated. The first deposits were in crystals, and constituted his *primitive* rocks; these contain no fossils. The deposits he termed 'formations,' and he taught that 'the exterior of the earth consists of a series of these formations laid over each other in a certain determinate order.'

1. The next deposits he called *transition formations*, or *secondary rocks;* the former term denoting that the earth was passing into a fit state for animals and vegetables. These rocks contain fossils, or alternate with those which do so.

2. A third series was then deposited, formed in great measure from the destruction of the primitive and the transition formations, and containing numerous fossils. From their greater approach to the horizontal position, Werner termed them *floetz*.

WE'RNERITE. Under this name, which was formerly restricted to some varieties of common and compact scapolite, are now united the *meionite* of Vesuvius, and the greater part of the *scapolite* of Werner, the *paranthine* and also the *dipyre*—substances which stand in need of further investigation as to their chemical and crystallographical characters.

WHEEL AND AXLE. One of the mechanical powers, consisting of two cylinders, having their axes coincident, the two cylinders forming one rigid piece, or being cut from the same piece: the larger is called the *wheel*, the smaller the *axle*. The cord by which the weight is suspended is fastened to the axle and coiled round it; the power acts sometimes by a cord coiled round the wheel;

sometimes by handspikes, as in the capstan; sometimes by handles, as in the windlass.

WHEEL-CUTTING. A term applied to a particular branch of practical mechanics, which comprehends the modes of cutting the teeth in the wheels used by watch and clock-makers, and for other mechanical purposes.

WHEEL, EXCENTRIC. An apparatus employed in double-acting steam-engines, for the purpose of opening and closing the valves of the cylinder. On the shaft or axis of the fly-wheel, or of the paddle-wheel, is fixed a wheel which revolves with it, but whose motion is *excentric* to it—that is, the centre of the wheel does not coincide with the centre of the shaft or axis; and, hence, the centre of the wheel moves round the axis of the shaft. The distance of the centre of the wheel from that of the shaft constitutes the amount of excentricity, and this amount is equal to one half of the range of motion of the valves which are to be worked by this mechanism.

WHEEL, PADDLE. A wheel placed at each extremity of the shaft of a marine steam-engine, for the purpose of propelling the vessel by its revolution. It may be considered as a series of *levers*, arranged in a circle, and brought successively into action; the *fulcrum* is obtained by the re-action of the water upon the paddles; the *resistance* to be overcome is that of the water opposed to the progress of the vessel, and acting on the centre of the wheel; the *power* by which the resistance is to be overcome, is applied by the cranks of the engine upon the shaft which connects the centres of the wheels.

WHEEL, RATCHET. A wheel employed for preventing motion in one direction, while it permits it in another. To effect this object, the teeth of the wheel are cut with their faces inclining in one direction, and a small lever or catch is so placed, as to enter the indentation and stop the wheel if it turn backwards, but slides over the teeth without obstructing them, if it move forward. Such a wheel is generally employed to prevent a weight raised by a machine from descending, and to obviate other retrograde movements.

WHEEL, SPUR, CROWN, BEVELLED. These are designations of toothed wheels, and denote the position of the teeth relatively to the axis. In the *spur wheel*, the teeth are raised upon the edge of the wheel, or are perpendicular to the axis; in the *crown wheel*, the teeth are parallel to the axis, or perpendicular to the plane of the wheel; in the *bevelled wheel*, the teeth are raised on a surface inclined to the plane of the wheel.

WHEEL, SUN AND PLANET. A contrivance for converting the alternating motion of the beam of a steam-engine into a rotatory motion. In this apparatus a toothed wheel is fixed upon the axis to be turned, and another wheel, gearing with it, is attached to the lower end of the connecting rod, so that it cannot revolve on its own axis. The result of this arrangement is that the second, or *planet-wheel*, passes completely round the first during each up and down stroke of the engine, and, in so doing, causes the first, or *sun-wheel*, to rotate upon its axis. This apparatus has been superseded by the crank.

WHEEL, UNDERSHOT. A water-wheel, in which the water strikes the float-boards below the axle, and acts by the impulse due to its velocity. See *Overshot wheel*.

WHET SLATE. *Whetstone-slate*. A variety of slate, occurring in beds in primitive and transition clay-slate. Very fine specimens are brought from Turkey, under the name of *hone-stones*.

WHINSTONE. A provincial term applied to some of the trap rocks.

WHIRLPOOL OR EDDY. The phenomenon which occurs when two opposite currents of the ocean meet one another, turn upon a centre, and assume a spiral form. The most celebrated whirlpools are those of the Euripus, the Charybdis, and the Maelstrom.

WHIRLWIND. A spiral or whirling motion of the wind, which occurs when its direction is influenced by the form of precipitous mountains, or when two winds meet each other at an angle, and then turn upon a centre. In the deserts of Africa, they sometimes draw up the sand into a moving pillar, which buries all in its way. When they occur on the ocean, they draw up the water, and produce *water-spouts*.

WHISPERING GALLERY. A dome or room so constructed that words uttered in a low tone at one spot are audible at some other spot, while persons standing between these two points cannot hear what is said. To produce this effect, the room should have an oval or elliptical form, so that words spoken in one focus may be heard in the other. The observatory at Paris contains an apartment of this kind.

WHITE COPPER. *Chinese Copper.* A white metallic compound brought from China; its composition is not generally known, but some of it is said to consist of copper and arsenic.

WHITE LEAD. *Ceruse.* Carbonate of lead, occurring in nature well crystallized, in the form of carbonate of barytes. It is employed by painters, as a white pigment, to give *body* to their colours.

WHITE PRECIPITATE. A compound formed when ammonia is added to a solution of chloride of mercury. It is free from oxygen, and contains nothing but the elements of a double chloride and amide of mercury.

WHITESTONE. *Eurite.* A variety of granite, in which felspar is the chief ingredient, the quartz, and especially the mica, being very rare; or in which all the ingredients are blended into a finely granular mass of a white appearance. Crystals of quartz are sometimes dispersed through the mass, rendering it porphyritic.

WHORL. In Malacology, this word denotes each complete turn of the spire of a spiral shell; the last, which terminates the aperture, is the body or *basal* whorl; the rest are the *spiral* whorls. For the use of this term in botany, see *Verticillus.*

WHY? As an interrogative, this word is employed in three senses: viz. "By what proof?" (or reason.) "From what cause?" "For what purpose?" This last is commonly called the "final cause." *E. g.* "Why is this prisoner guilty of the crime?" "Why does a stone fall to the earth?" "Why did you go to London?" Much confusion has arisen from not distinguishing these different inquiries. *Whately.*

WICKLESS LAMP. This ingeniously contrived lamp is, as it is commonly called, a *self-generating gas apparatus.* It iserves to manufacture oil-gas without the inconvenience of a retort and furnace. In its common form this lamp consists of a light and buoyant dish, which is intended to support the small tube through which the oil is intended to be raised; this is effected, partly by capillary attraction, and partly by hydrostatic pressure. On applying a taper to the tube, the oil is decomposed at the extremity, and gas is generated.

WI'LLEMITE. A variety of silicate of zinc, from Aix-la-Chapelle.

WINCH AND AXLE. A well-known apparatus, constituting a small windlass, and employed in its simplest form to raise water from a well, or solid materials from the shaft of a mine; in a more complex form, it is connected with a crane for the purpose of raising heavy packages from the ground to the upper part of a building. Its mechanical power is precisely that of the wheel and axle.

WIND. A current in the atmosphere, occasioned by inequality of temperature of the atmosphere at different points of the earth's surface, or in different regions of the atmosphere of equal elevation. *Permanent winds* are those which blow constantly between, and a few degrees beyond, the tropics (See *Trade Winds*). Those which blow at certain periods, as the monsoons, the land and sea-breezes, &c., are called *periodical winds.*

1. *Etesian Winds.* A term formerly applied to those winds which blow every summer during six weeks over the countries bordering the Mediterranean, but now applied to other periodical winds, as those which blow on the coast of Holland.

2. *Helm Wind.* A violent wind which occasionally prevails between Brampton in Cumberland and Brough in Westmoreland, a distance of 40 miles. Its presence is indicated by a belt of clouds, denominated the *helm bar,* which remains immoveable during twenty-four or even thirty-six hours, collecting or attracting to itself all the light clouds which approach it. So long as this bar continues unbroken, the wind blows with unceasing fury, not in gusts, like other storms, but with continued pressure.

WIND-GAGE. An instrument for measuring the force or velocity of the wind. Various contrivances for this purpose have been employed. One of these is described under the term *Anemometer.*

WIND-GUN. This is a more formidable instrument than the *air-gun.* It contains a magazine of bullets as well as another of air, and when it is properly charged, the bullets may be projected one after another as fast as the gun can be cocked and the pan opened. The syringe is fixed to the butt of the gun, by means of which it is easily charged, and may be kept in that state for a long time.

WINDLASS. A modification of the wheel and axle, consisting of a barrel which turns upon two points of support on a pivot at each extremity of its axis, or upon a pivot at one extremity only. The *winch* or *crank*, by which the barrel is turned, is moved round by the hand, and there is no difference in the principle whether a whole wheel is turned, or a single spoke. The winch, therefore, answers to the wheel, while the rope is taken up, and the weight raised by the axle.

WINE. The name given by chemists to all liquors which have become spirituous by fermentation.

WINE TEST. A reagent for detecting the presence of lead in wine, by converting the acid into a salt of lead. That which is usually sold is made by dissolving half an ounce of sulphuret of arsenic, and one ounce of lime, in half a pint of distilled water, and filtering the solution.

WINTERACEÆ. The Winter's Bark tribe of Dicotyledonous plants. Trees or shrubs, with *leaves* alternate; *flowers* hermaphrodite or unisexual; *stamens* hypogynous; *fruit* consisting of a single row of carpella.

WI'THAMITE. A mineral found at Glencoe in Scotland, and regarded as a variety of epidote.

WI'THERITE. Carbonate of baryta, or rhomboidal baryta, found in Cumberland and Durham in lead veins traversing a secondary limestone, which rests on red sandstone.

WOLFRAM. Tungstate of iron and manganese, occurring, massive and crystallized, in Bohemia and other countries; also in the form of octohedral supposititious crystals, derived from tungstate of lime.

WO'LKONSKOIT. An emerald-green mineral, containing oxide of chromium, iron, silica, and magnesia, and found at Perm in Russia.

WO'LLASTONITE. Table spar; a silicate of lime, found at Mount Vesuvius, at Nagyag, &c.

WO'LNYNE. A variety of sulphate of baryta found at Muzsay in Hungary.

WOOD, ROCK. *Mountain wood.* A variety of asbestus, usually massive, of a brown colour, and having the aspect of wood.

WOOD-OPAL. Opalized wood; one of the varieties of opal, occurring in various vegetable forms.

WOOD-STONE. The name given by Werner to specimens of wood which have been converted into *hornstone*, a siliceous substance sometimes approaching to flint or common quartz.

WOOD-TIN. The name given by Werner to one of his divisions of *oxide of tin* or *tin-stone;* a variety of which, composed of radiated-fibrous small globules, and marked with concentrically-disposed brown and yellow colours, is called *toad's eye wood-tin*.

WOODY TISSUE. *Pleurenchyma.* Elongated cells, tapering to each end, and constituting the elementary structure of wood.

WOORALY. A celebrated poison, also called *woorari*, *ourari*, or *urari*, produced by the Strychnos toxifera of Guayana.

WOOTZ. Indian steel; supposed to be an alloy of steel with small quantities of silicium and aluminum.

WOULFE'S APPARATUS. A series of two or three-necked bottles, connected together by intermediate tubes, used for impregnating water with carbonic and other gases.

WREDE'S EXPERIMENT. An experiment instituted by Von Wrede for measuring the velocity with which heat is propagated. By means of a thermo-electric calorimeter, placed in a telescope, it was found that the temperature of the eastern edge of the sun's image exceeded that of the western edge, and consequently the velocity of the rays of heat was less than that of the luminous rays. The rate of the velocity of heat radiated from the sun is only $\frac{4}{5}$ths the velocity of light, or about 163,600 miles in a second.

Bancroft Library

X

XANTHIC AND CYANIC SERIES. Botanists have divided flowers into two great series, with reference to their colours, viz. those having yellow for their type, and which are capable of passing into red or white, but never into blue; and those of which blue is the type, which can pass into red or white, but never into yellow. The former series is termed, by some writers, *oxidised*, and the latter *disoxidised;* and greenness is considered as a state of equilibrium between the two series. De Candolle called the first series *xanthic* (ξανθὸς, yellow), and the second *cyanic* (κύανος, blue). The two series may be thus expressed:—

Green.

Xanthic.	Greenish-blue	Yellow-green	Cyanic.
	Blue	Yellow	
	Violet-blue	Orange-yellow	
	Violet	Orange	
	Violet-red	Orange red	

Red.

XANTHIC ACID (ξανθὸς, yellow). An acid composed of sulphur, carbon, hydrogen, and oxygen, and named from the yellow colour of its compounds.

XANTHIC OXIDE (ξανθὸς, yellow). A species of calculus, named from the lemon-coloured compound which it forms by the action of nitric acid.

XANTHITE. A congeries of yellow grains, no larger than those of sand, easily separable from one another; found in a limestone bed at Amity in the United States.

XA'NTHOGEN (ξανθὸς, yellow, γεννάω, to produce). A term applied to a compound of sulphur and carbon, forming the radical of hydroxanthic acid, from its property of forming yellow compounds with certain metals.

XA'NTHOPHYLL (ξανθὸς, yellow, φύλλον, a leaf). *Anthoxantine.* The yellow colouring matter which appears in the leaves of plants in autumn. See *Chlorophyll.*

XANTHOPRO'TEIC ACID. An orange-yellow powder, formed when albumen, or any other protein-compound is digested in nitric acid.

XA'NTHOUS (ξανθὸς, yellow). A term applied by Dr. Prichard to one of the three varieties of mankind, derived from the colour of the hair, and including all individuals or races which have brown, auburn, *yellow,* flaxen, or red hair.

XI'PHIAS DORA'DO. The Sword Fish; a modern southern constellation, consisting of seven stars.

XIPHOSU'RA (ξίφος, a sword, οὐρὰ, a tail). A division of the entomostracous crustaceans, in which the last segment of the body forms a long, three-edged, sharp-pointed weapon, as in the limulus or Molucca crab.

XI'PHYRRHYNCHS (ξίφος, a sword, ῥύγχος, a beak). The designation of a family of acanthopterygious fishes, of which the *xiphias,* or sword-fish, is the type.

XY'LITE (ξύλον, wood). *Lignone.* A liquid existing in commercial pyroxylic spirit. There are several other products of the distillation of wood, named xylitic acid, xylite-resin, xylite-naphtha, xylite-oil, &c.

XYLO'DIUM. A term applied by Desvaux to the nut of Anacardium. This fruit is, however, generally referred to the *achænium* of other writers.

XYLOIDINE. The name given to paper which has been immersed for a moment in strong nitric acid, and then washed in distilled water. The paper acquires the toughness of parchment and the combustibility of tinder.

XYLO'PHAGI (ξύλον, wood, φάγω, to eat). Wood-eaters; a family of the tetramerous Coleoptera, which usually live on wood, which their larvæ penetrate in every direction. By the term *xylotroges* (τρώγω, to gnaw) is denoted a tribe of serricorn beetles, which perforate timber; and by that of *xylophilans* (φιλέω, to love) a tribe of beetles which live on decayed wood.

Y

YA'NOLITE. A designation of the *axinite* of Haüy, and thumerstone of Kirwan; an alumino-silicate of lime and iron.

YEAR. The period of time in which the earth performs her revolution round the sun, or that in which the sun apparently moves from a point in the ecliptic until he returns to the same point, is called the *solar year.* This is also termed the *tropical year,* and it consists of 365d. 5h. 48m. 49s. 7. This is the period adopted as the standard for the measurement of time, for all the purposes of civil life; hence, it is also called the *civil year.*

1. The *sidereal year* is measured from the departure of the sun from any fixed star to his return to the same star; it is longer than the tropical year, consisting of 365d. 6h. 9m. 9s. 6, reckoned in mean solar time, or 366d. 6h. 9m. 9s. 6 reckoned

in sidereal time. The reason of this difference is, that, as the sun's apparent annual motion *among* the stars is performed in a contrary direction to the apparent *diurnal* motion of both sun and stars, it comes to the same thing as if the diurnal motion of the sun were so much *slower* than that of the stars, or as if the sun lagged behind them in its daily course. When this has gone on for a whole year, the sun will have fallen behind the stars by a whole circumference of the heavens; or, in other words, in a year, the sun will have made fewer diurnal revolutions by one than the stars. The proportion between the mean solar and the sidereal day is, when reduced to a decimal fraction, that of 1.00273791 to 1.

2. The *anomalistic year* is the time which elapses between the sun's leaving his apogee and his return to it, consisting of 365d. 6h. 13m. 49s. 3. The difference between this and the tropical or civil year is owing to the orbit of the earth representing an ellipse, of which the major axis has a slow motion of $11''.8$ per annum in advance.

3. *Historical and ecclesiastical year.* In England, the *historical year* was, for a very long period, begun on the 1st of January. But the *civil*, *ecclesiastical*, and *legal* year began, until the end of the thirteenth century, at Christmas. In and after the fourteenth century, it commenced on the 25th of March, and so continued until the 1st of January, 1753. Much confusion arose from these two modes of computing dates; for the legislature, the ecclesiastics, and the civilians, referred every event which happened between the 1st of January and the 25th of March to a different year from historians.

4. To avoid, so far as possible, the mistakes which this custom produced, it was usual to *add* the date of the *historical* to that of the *legal* year, when speaking of any day between the 1st of January and the 25th of March; thus,—

$$\text{Jan. 30, 164}\begin{cases}8 & \text{\textit{i. e.} the \textit{civil} and \textit{legal} year,}\\ 9 & \text{\textit{i. e.} the \textit{historical} year;}\end{cases}$$

or, thus:

January 30, 1648-9.

YEAST. *Fermentum.* A substance generated during the vinous fermentation of vegetable juices and decoctions, rising to the surface in the form of a frothy, flocculent, and somewhat viscid matter. It is used for promoting fermentation. See *Catalysis.*

Artificial Yeast may be made by boiling malt, pouring off the water, and keeping the grains in a warm place to ferment, repeating the process till a sufficient quantity is procured.

YELLOW EARTH. A massive mineral of an ochre-yellow colour, consisting of silica, alumina, iron, and lime. It occurs in Upper Lusatia, associated with clay and clay-ironstone. When burnt, it is sold by the Dutch as a pigment, under the name of English red.

YENITE. Another name for *lievrite*, a double silicate of lime and iron, found in the Isle of Elba and in Norway. It was named *yenite* by Lelièvre, its discoverer, in honour of the battle of Jena.

YOU-STONE. Chinese jade; a zeolitic substance referred to *prehnite.*

YTTRIA. A new earth, discovered by Gadolin, in a mineral from *Ytterby* in Sweden. Its metallic base is *yttrium*, of which it is considered to be a protoxide.

YTTRO-CERITE. A mineral substance containing yttria, oxide of cerium, and fluoric acid; it is found at Finbo in Sweden, imbedded in quartz, or incrusting pyrophysalite.

YTTRO-TANTALITE. An ore of tantalum, also called yttrious oxide of tantalum, found in reniform masses at Ytterby in Sweden.

Z

ZAFFRE. An impure oxide of cobalt, being the residuum of the native arseniuret of cobalt, after the sulphur, arsenic, and other volatile matters of this mineral have been expelled by calcination. The substance brought from Saxony, and commonly sold under this name, is a mixture of oxide of cobalt with vitrifiable earth.

ZAMITE. The name given to the fossil species of zamia, the principal forms of which have been found in the lias and oolitic formations. They differ from the other species in the exsertion and venation of their leaves.

ZANTHOPI'CRITE. A crystalline substance extracted from the bark of the *zanthoxylum* of the Caribbee islands.

ZEA'GONITE. A Vesuvian mineral referred to the *harmotone* or cross-stone, and to the *potass* division of this zeolitic substance.

ZE'CHSTEIN. A magnesian of limestone, abounding in Germany, and belonging to the New Red Sandstone group.

ZE'IN. A substance procured from the *zea mays*, resembling gluten, but said to be destitute of nitrogen.

ZENITH AND NADIR. These are astronomical terms derived from the Arabic, and they denote two points of the sphere of the heavens, the former vertically over a spectator's head, the latter vertically under his feet; they are, therefore, the vanishing points of all lines *mathematically* parallel to the direction of a plumb-line at his station. They are the *poles* of the celestial horizon, ***i. e.*** points 90° distant from every point in it.

ZENITH DISTANCE. An astronomical term, denoting the complement of the altitude of the sun, or other heavenly body. *Vertical circles* of the sphere are great circles passing through the zenith and the nadir, or great circles perpendicular to the horizon; on these are measured the *altitudes* of objects above the horizon—the complements to which are their *zenith distances.*

ZENITH SECTOR. An astronomical instrument, consisting of a *portion* of a divided circle, employed for measuring accurately the zenith distances of stars which pass near the zenith. This instrument is also used in trigonometrical surveys for determining the difference of latitude of two stations; for the difference of the zenith distances of the same star, observed at its meridional passages at two places, gives the difference of the astronomical latitudes of the places without any regard to the star's declination.

ZE'OLITES (ζέω, to boil, λίθος, a stone). A term applied to the silicates of lime and alumina, from their *frothing*, when heated before the blow-pipe. This is a very extensive mineral genus, containing the dodecahedral species, or *leucite;* the hexahedral, or *analcime;* the rhomboidal, or *chabasite;* the pyramidal, or *cross-stone;* the diprismatic, or *laumonite;* the prismatic, or *mesotype*, comprising the fibrous zeolite, natrolite, and mealy zeolite; the prismatoidal, or *stilbite*, comprehending foliated and radiated zeolite; and the axifrangible, or *apophyllite.*

ZE'RO (*tsaphara*, Arab., empty). A term used to denote a cipher placed between the ascending and the descending numbers of a scale or series. The zero of Fahrenheit's thermometer is 32° below the melting point of ice; that of the centigrade scale coincides with the freezing point of water. The *absolute zero* is the imaginary point in the scale of temperature at which the whole heat is exhausted; it is the expression of absolute cold, or privation of caloric.

ZERO POINT. The term applied by astronomers to that point of the equinoctial, called the *equinox*, through which they suppose the hour circle to pass, from which all others are reckoned, and which point is itself the *zero point* of all right ascensions counted on the equinoctial.

ZETE'TICS (ζητέω, to search). The name given by Vieta to the department of algebra which consists in the direct search after unknown quantities. The term is now obsolete.

ZEUXITE. A zeolitic substance, found in Huel-Unity Mine, near Redruth, in Cornwall.

ZINC. A bluish-white metal, occurring in the form of oxide, or *red zinc;* of sulphuret, or *blende;* of carbonate, or *calamine;* of sulphate, or *white* or *zinc vitriol;* of silicate, or *electric calamine;* and of aluminate, or *automalite* or *gahnite.* It has been called marcasite, Indian tin, and *spelter*. When rolled into thin leaves, it is termed *sheet zinc*. The mineral substance, *zinc bloom*, is of the same composition as calamine, or the carbonate of this metal.

1. *Zinc, flowers of.* This is the oxide, formed by exposing the metal to the air at a temperature a little above its melting point, when it flies up in the form of white flowers. It has hence received the fanciful names of *nihil album* and *philosophical wool.* By the ancients it was called pompholix. In Holland it was sold as a secret remedy under the names of *luna fixata* and *arcanum Ludemanni.*

2. *Zinc, butter of.* This is the chloride or hydrochlorate, obtained as a whitish-grey mass, with the consistency of wax or butter.

ZINCOID AND CHLOROID. These terms are applied, on the electrical hypothesis, to the plates of a decomposing cell: the chlorous plate, which is in connection with a zinc plate, is termed the *chloroid* (like chlorine, quasi-chlorine), and is the same as the negative pole, the negative electrode, the cathode and the platinode; while the zincous plate, which is connected with a copper plate, is called the *zincoid* (like zinc, quasi-zinc), and represents the positive pole, the positive electrode, the anode, and the zincode. See *Polarity, Chemical.*

ZINCO'LYSIS. A term equivalent to *electrolysis*, denoting a mode of decomposition occasioned by the inductive action of the affinities of zinc or the positive metal.

ZI'NCOLYTE. A term equivalent to *electrolyte*, denoting a body decomposible by electricity, the decomposition being referred to the action of zinc or the positive metal.

ZINCOUS ELEMENT. The basic or positive element of a binary compound. The negative is termed the *chlorous element.*

ZINCOUS POLE. A term founded on the theory that the particles of matter are susceptible of polarity. Hence that pole of a particle of zinc or of hydrochloric acid which has the attraction, or affinity, which is characteristic of zinc, or *zincous* attraction, is called the *zincous pole.* See *Chlorous Pole.*

ZINGIBERA'CEÆ. *Scitamineæ.* The Ginger tribe of monocotyledonous plants. Aromatic tropical *herbaceous* plants, with a creeping *rhizome*, and *stem* formed of the cohering bases of the leaves; *inflorescence* either a dense spike, or a raceme, or a sort of panicle, terminal or radical. The family are monandrous, with a whole anther, and are thus distinguished from the allied family *marantaceæ*, which are monandrous, with only half an anther; and from the *musaceæ*, which have five or six anthers.

ZI'NKENITE. A mineral containing sulphur, lead, antimony, and copper. It is nearly related to plumose antimony.

ZIRCON. A heavy, hard, sparkling, and transparent stone, having a strong double refraction. It is usually divided into the two varieties of *hyacinth* and *jargon*, the former having a yellowish-red colour, and the latter being most esteemed when colourless.

ZIRCO'NIA. The oxide of zirconium; a peculiar earth, discovered in the *zircon* of Ceylon, a silicate of zirconia, which is also found in the syenitic mountains of the south-east side of Norway. The *hyacinth* is the same mineral of a red colour.

ZIRCO'NIUM. The metallic basis of *zirconia*, obtained in the form of a black powder, resembling that of charcoal.

ZOANTHA'RIA (*ζῶον*, an animal, *ἄνθος*, a flower). Animal-flowers; the third class of zoophytes, in the arrangement of De Blainville, who gives the following definition: — "Body regular, flower-shaped, more or less elongated, free or fixed, very contractile, furnished with an intestinal canal (?), without distinct walls, having a single large terminal opening surrounded by variously-shaped tentacula, which are always tubular and in communication with the musculo-cavernous parenchyma of the skin."

ZOA'NTHIDÆ. A family of the *zoantharia* of De Blainville, comprising animals coriaceous, simple, or compound, fixed; tentacula marginal, surrounding the mouth.

ZO'DIAC (*ζώδιον*, a little animal). The area within which the apparent motions of the sun, moon, and all the greater planets are confined. It consists of a zone, or belt, extending nine degrees on either side of the ecliptic, and named from its containing the figures of all the animals, &c., which formed the twelve signs. The names of the signs are derived from comparisons made by the Egyptians between celestial and terrestrial phenomena, for the most part purely of a local nature, and belonging exclusively to a part of their country. See *Signs of the Zodiac.*

ZODI'ACAL LIGHT. A term applied by astronomers to a revolving ring of finely-divided or nebulous matter, situated perhaps between the orbits of Venus and Mars, but certainly extending beyond that of the earth. This phenomenon rising pyramidally illumines a portion of the unvarying length of the tropical nights. In the temperate zone, it is only distinctly visible in the beginning of spring, when it may be seen after evening twilight above the Western horizon, and at the end of Autumn, before the commencement of morning twilight above the Eastern horizon.

ZO'ISITE. A sub-species of prismatoidal augite, distinguished into the common and the friable. It was named after its discoverer, the Baron Von Zois.

ZONE (*zona*, a girdle). The geographical denomination of each of the five parallel belts into which the earth is imagined to be divided in respect to temperature. The *torrid zone* includes all the space which lies between the tropics, being nearly 47 degrees, or 23½ degrees on each side of the equinoctial line. Two *frigid zones* occupy those parts which lie between the poles and the polar circles; and two divisions which lie between those circles and the torrid zone, are called the *temperate zones.*

ZO'OCARPES (*ζῶον*, an animal, *καρ-*

πός, fruit). The name given to certain organized bodies which have been variously considered as animals, as plants, and as partaking of the characters of each of these divisions of organized beings. They are found among the *lower forms* of *algæ* of botanists, as the diatoma, the fragillaria, &c.

ZOO'LOGY (ζῶον, an animal, λόγος, a description). That branch of Natural Science which investigates the nature, properties, and classification of the subjects of the Animal Kingdom. Under the term *Animal Kingdom*, a table is given of the terms employed by different writers in classifying these subjects.

1. *Divisions of Aristotle.* Aristotle's primary divisions were derived from the presence and the (supposed) absence of *blood* in animals, which were, therefore, termed *enaima* (ἐν, in, αῖμα, blood) or sanguineous, including beasts, birds, reptiles, and fishes; and *anaima* (α, priv. αῖμα, blood) or ex-sanguineous, including all the lower species. The subsequent discovery of white blood in animals, and the substitution of the terms "red-blooded" and white-blooded" for the primary divisions of Aristotle, were steps in the progress of improvement.

2. *Divisions of Linnæus.* In the "Systema Naturæ" the natural divisions of the Animal Kingdom are indicated by internal structure. Thus, with a bilocular *heart* with two auricles, and warm, red *blood*, we have viviparous animals in the *Mammalia*, oviparous in the *Birds.* With a unilocular *heart* with one auricle, and cold, red *blood*, we have, furnished with arbitrary lungs, the *Amphibia*, with external gills, the *Fishes.* With a unilocular *heart* with one auricle, and cold, white circulating fluid (*sanies*), we have, furnished with antennæ, the *Insects*, with tentacula, the *Worms.*

3. *Divisions of Cuvier.* The following table exhibits Cuvier's fourfold division of the Animal Kingdom, together with the classes, sub-classes, orders, and an example of each division:—

DIV. I.—VERTEBRATA.

Animals which have an internal skeleton, supported by a spine.

Class.	*Sub-Class.*	*Order.*	*Example.*
I. MAMMALIA Animals which suckle their young.		1. Bimana.	Man.
		2. Quadrumana.	Monkeys.
		3. Carnivora.	Hyæna.
		4. Rodentia.	Rabbit.
		5. Edentata.	Sloth.
		6. Pachyderma.	Elephant.
		7. Ruminantia.	Cow.
		8. Cetacea.	Whale.
II. AVES Birds.		1. Accipitres.	Eagle.
		2. Passeres.	Sparrow.
		3. Scansores.	Parrot.
		4. Gallinæ.	Pheasant.
		5. Grallæ.	Heron.
		6. Palmipedes.	Duck.
III. REPTILIA Reptiles.		1. Chelonia.	Tortoise.
		2. Sauria.	Lizard.
		3. Ophidia.	Serpent.
		4. Batrachia.	Frog.
IV. PISCES Fishes.	I. OSSEOUS	1. Acanthopterygii.	Perch.
		2. Malacopterygii Abdominales.	Pike.
		3. Malacopterygii Sub-brachiati.	Cod.
		4. Malacopterygii Apodes.	Eel.
		5. Lophobranchii.	Hippocampus.
		6. Plectognathi.	Sun-fish.
	II. CARTILAGINOUS. Chondropterygii.	7. Sturiones.	Sturgeon.
		8. Selachii.	Shark.
		9. Cyclostomi.	Lamprey.

DIV. II.—MOLLUSCA.

Soft, invertebral, inarticulate animals, often protected by a shell.

Class.	*Order.*	*Example.*
I. CEPHALOPODA Head-footed.	(One.) Cephalopoda.	Cuttle-fish.
II. PTEROPODA Fin-footed.	(One.) Pteropoda.	Clio.
III. GASTEROPODA Belly-footed.	1. Pulmonibranchia.	Snail.
	2. Nudibranchia.	Glaucus.
	3. Inferobranchia.	Diphyllidia.
	4. Tectibranchia.	Bulla.
	5. Heteropoda.	Carinaria.
	6. Ptenobranchia.	Whelk.
	7. Tubulibranchia.	Vermetus.
	8. Scutibranchia.	Sea-ear.
	9. Cyclobranchia.	Chiton.
IV. ACEPHALA Headless.	1. Testacea.	Oyster.
	2. Nuda.	Ascidia.
V. BRACHIOPODA Arm-footed.	(One.) Brachiopoda.	Lingula.
VI. CIRRHOPODA Bristle-footed.	(One.) Cirrhopoda.	Barnacle.

DIV. III.—ARTICULATA.

Animals with bodies covered with a case divided into rings.

	Section.		
I. ANNELIDA Ring-bodied animals.		1. Tubicola.	Wormshell.
		2. Dorsibranchia.	Lobworm.
		3. Abranchia.	Earthworm.
II. CRUSTACEA, Crustaceous animals.	I. MALACOSTRACIA, Crustaceous-shelled.	1. Decapoda.	Lobster.
		2. Stomapoda.	Sea mantis.
		3. Amphipoda.	Shrimp.
		4. Læmodipoda.	Whale-louse.
		5. Isopoda.	Cymothoa.
	II. ENTOMOSTRACIA, Thin-shelled.	6. Branchiopoda.	Monoculus.
		7. Pœcilopoda.	King-crab.
III. ARACHNIDA The Spider-tribe.		1. Pulmonata.	Tarantula.
		2. Trachearia.	Mite.
IV. INSECTA Insects.		1. Myriapoda.	Centipede.
		2. Thysanoura.	Springtail.
		3 Parasita.	Louse.
		4. Suctoria.	Flea.
		5. Coleoptera.	Beetle.
		6. Orthoptera.	Ear-wig.
		7. Hemiptera.	Bug.
		8. Neuroptera.	Ant-lion.
		9. Hymenoptera.	Wasp.
		10. Lepidoptera.	Butterfly.
		11. Rhipiptera.	Stylops.
		12. Diptera.	Fly.

Div. IV.—RADIATA.

Animals disposed around an axis.

Class.	*Order.*	*Example.*
I. ECHINODERMA .... Hard-skinned.	1. Pedicellata. 2. Apoda.	Star-fish. Sipunculus.
II. INTESTINA .... Intestinal worms.	1. Cavitaria. 2. Parenchyma.	Guinea-worm. Tapeworm.
III. ACALEPHA .... Sea-nettles.	1. Simplex. 2. Hydrostatica.	Medusa. Spanish man-of-war.
IV. POLYPI .... Plant-like animals.	1. Carnosa. 2. Gelatinosa. 3. Corallicola.	Sea anemone. Vorticella. Coral.
V. INFUSORIA .... Water animalcules.	1. Rotifera. 2. Homogenea.	Wheel insect. Globeanimalcule.

ZOO'NIC ACID (ζῶον, an animal). This is merely the acetous acid, holding animal matter in solution.

ZOO'NOMY (ζῶον, an animal, νόμος, a law). The science which treats of the laws of organic life.

ZOO'PHAGOUS (ζῶον, an animal, φάγω, to eat). Animal-eating; a term applied to a division of the cetaceous animals, and to a tribe of carnivorous gasteropods — the *pectinibranchiata* of Cuvier. See *Phytophagous*.

ZO'OPHYTES (ζῶον, an animal, φύτον, a plant). Animal-plants; a division of the animal kingdom, including the corals, sponges, and other aquatic animals allied to them. They are so named, because, while they are the habitation of *animals*, they are fixed to the ground, and have the forms of *plants*. They were considered by Cuvier as synonymous with the radiata. Their characters are given under the terms Echinodermata, Entozoa, Acalephæ, Polypus, and Infusoria.

ZUBENELY, or β LIBRA. A star of the second magnitude, in Libra.

ZUBENESCH, or α LIBRA. A star of the second magnitude, in Libra.

ZUBERNICH MELI. A star of the second magnitude in the constellation Libra.

ZUMIC ACID (ζύμη, leaven). An acid discovered in vegetable substances which have undergone the acetous fermentation. It has been shown to resemble closely the *lactic acid*.

ZUMO'METER (ζύμη, leaven, μέτρον, a measure). *Zumosimeter*. An instrument for measuring the degree to which fermentation has proceeded in fermenting liquors.

ZU'NDERERZ. Tinder ore; an ore of silver, occurring in the Hartz, in fibrous flakes resembling *tinder*.

ZURLITE. A mineral occurring in rectangular prisms and in botryoidal masses, of an asparagus-green colour. It occurs on Mount Vesuvius with calcareous spar.

ZYGODA'CTYLES (ζυγὸς, a yoke, δάκτυλος, a finger). The name given by Zemminck to an order of climbing birds, including those which have the toes arranged in pairs, two before and two behind, as the parrot, the woodpecker, the toucan, the cuckoo, &c. They correspond with the *Scansores* of Cuvier.

ZYGÆ'NIDÆ. A tribe of lepidopterous insects, named from the typical genus *zygæna*, and arranged by Linnæus with the *Sphinges* on account of the resemblance of their antennæ to those of that family.

ZYGOPHYLLA'CEÆ. The Bean Caper tribe of dicotyledonous plants. Trees, shrubs, and herbaceous plants, with *leaves* opposite; *flowers* polypetalous, symmetrical; *stamens* hypogynous; *ovarium* many-celled; *fruit* capsular.

ZY'MOME (ζύμη, leaven). The residue of the gluten of wheat, after it has been treated by alcohol, and has parted with its gliadine and water. It produces various kinds of fermentation, according to the nature of the substance with which it comes in contact.

THE END.

GILBERT & RIVINGTON, Printers, St. John's Spuare, London.

WORKS BY THE SAME AUTHOR.

I.

DICTIONARY OF MEDICAL TERMS.

Fourth Edition.

NOTICES OF THE FIRST EDITION.

"A work much wanted, and very ably executed."—*London Medical Journal*, Sept. 1835.

"This compendious volume is well adapted for the use of Students. It contains a complete Glossary of the terms used in Medicine,—not only those in common use, but also the more recent and less familiar names introduced by modern writers. The introduction of tabular views of different subjects is at once comprehensive and satisfactory. It must not however be supposed that the volume is a mere word-book; it is, on the contrary, an extremely interesting manual, beautifully printed, containing much excellent matter in a little space, and is deserving of our strong recommendation."—*Medical Gazette*, Sept. 1835.

"Concise and ingenious."—*Johnson's Medico-Chirurg. Journal*, Oct. 1835.

"It is a very learned, painstaking, complete, and useful work—a Dictionary absolutely necessary in a medical library."—*Spectator*, Nov. 1, 1835.

NOTICE OF THE SECOND EDITION.

"We gave a very favourable account of this little book on its first appearance, and we have only to repeat the same *with emphasis*. It is for its size decidedly the best book of its kind, and ought to be in the possession of every student. Its plan is sufficiently comprehensive; and it contains an immense mass of necessary information in a very small compass."—*British and Foreign Medical Review*.

II.

MANUAL OF NATURAL PHILOSOPHY.

By COMSTOCK AND HOBLYN.

Second Edition, fcap. 8vo. (494 pp.), Steel Plate, and 281 wood-cuts.
6*s*. cloth, or 6*s*. 6*d*. *strongly bound.*

"We can heartily recommend this work as being as good an introduction to mathematical sciences as an unmathematical treatise can be."—*Gentleman's Magazine*.

III.

A MANUAL OF CHEMISTRY,

Illustrated by Seventy-five Engravings. Fcap. 8vo. *cloth*, 4*s*. 6*d*.

"This is an excellent compendium, and is well calculated to confer benefit both on the student and on the medical practitioner. It equally deserves our commendation as an important guide to general education."—*Lancet*, 1841.

"Mr. Hoblyn's 'Manual of Chemistry' is entitled to general praise, for the grasp of its subject, the distinctness of its arrangement, the fulness of its matter, and the clearness of its style, as well as for the force with which the points of the subject are frequently impressed upon the mind by the selection of some striking fact."—*Spectator*, 1841.

IV.

A MANUAL OF THE STEAM ENGINE.

Illustrated by numerous Engravings on Steel and Wood. Fcap. 8vo. 6*s*.

"A work which, for cheapness and compactness, extensive range of subject, and competent illustration, we can safely recommend to our readers as the best of the day."—*Railway Magazine*, 1842.

V.

FIRST BOOKS IN SCIENCE.

Price 1*s*. each,

1. ASTRONOMY.
2. NATURAL PHILOSOPHY.
3. HEAT, LIGHT, AND ELECTRICITY.
4. CHEMISTRY.

See Gulf Stream !

Aldebaran !